PERSONALITIES

By George F. Taubeneck

Wild West

John Kumler, manager of the sales contest division of Buckley, Dement Co., tells a good yarn about an unexpected twist to one of the "100 Point Conventions" of leading N.C.R. salesmen.

That year it happened that the nation's No. 1 cash register salesman was a 10-gallon-hatted bucko from Colorado. Precious-metal mining had boomed the state that year, and a startling amount of pay dirt was being cashed in to buy beer and hard likker.

Saloons lined the blocks of these mining towns, and from the First and Last Chance up through the Burning Bush, Red Dog, Growling Bear, Scalped Gringo, and Diamond Garter clear down to the Silver Slipper, about all this salesman had had to do was walk in with his carryable model to make a sale and obtain cash with the order.

But somehow Mr. Patterson hadn't heard about the special conditions prevailing in Colorado at that time. (Maybe it was a conspiracy.) So, as was his custom, he asked the Westerner to come forward and demonstrate to the convention just how he made a sale.

Confidently expecting to hear a presentation that would be a model for eloquence and completeness, Mr. Patterson took a chair on the platform to play the part of the salesman.

"Now, now, now, sir," he stuttered when the grinning six-foot salesman stepped up, "begin. Do just as you would do if I were a prospect."

The star salesman followed instructions to the letter, come what may.

"Hullo, thar, John, you old ———, ———," shouted the man from the Wild West, fetching Patterson a swinging crack on the back which knocked J. H. completely off his chair and almost off the platform!

The convention was adjourned for the day.

* * *

Through the Roof

An instance of Patterson's sublime impatience with apparently insurmountable obstacles is to be had in the yarn about the time he put up an automobile as a grand prize in a sales contest.

Day before the contest winners were to arrive for the presentation and celebration in Dayton, the automobile dealer through whom Patterson had purchased his grand prize drove up to N.C.R. headquarters with the blue-ribbon car.

"Put it right inside the entrance," directed Mr. Patterson, "so that the salesmen will see it immediately after they walk through the door."

"But Mr. Patterson," expostulated both the automobile dealer and the celebration manager, "you can't get that car through the door."

Mr. Patterson didn't explode. He merely ordered, quietly: "That car must be just inside the door by tomorrow morning." Whereupon he turned on his heel and left.

And, by all the saints, it was done. The car was elevated to the roof, and a hole was cut out so that the grand prize could be lowered inside to the desired position!

* * *

Shot on the Head

Harry J. Hunt, president of Trupar Mfg. Co., Columbus, Ohio, remembers the time he was taken to Battle Creek, Mich., along with several other N.C.R. supervisors, for a course of sprouts.

Specialized diet, it seems, wasn't enough.

Battle Creek citizens were shocked and nonplussed when they saw these supervisors—apparently, sane, sober men in every respect—walking around balancing 12-lb. iron weights (shot) on their heads.

Patterson believed it would teach them properly erect carriage!

* * *

20 Years Too Long

President Harry Hunt of Trupar Mfg. Co. also tells one about the time an N.C.R. inspector was fired after a quarter of century of service in the big Dayton plant. Angered, this inspector determined to carry his case straight to John H. Patterson himself.

Stomping out to the 1,100-acre Patterson estate, Far Hills (which later was turned over to the city of Dayton for public use), the outraged inspector sought audience with Mr. Patterson. The audience was granted.

"Now, now," queried Mr. Patterson, after the inspector had stated his mission and his case, "how long did you say you had been with the company?"

"Twenty-five years, sir," answered the inspector, proudly.

"Oh, my, my," returned J. H. P., "that's at least 20 years too long. You should have been fired years ago!"

* * *

Additional Biography

Further to make us his debtor, Mr. Hunt supplies the following additional biographical data on Patterson's life:

The seventh of eleven children, he was born in 1844 on his grandfather's farm (named, of all things, "the Rubicon,") outside of Dayton. As a youth he helped his father and brothers work the farm, and in 1862, while his father was a member of the Ohio state legislature at Columbus, he obtained his first business training by keeping the records at his father's sawmill.

He learned his three R's at the district school house, and following his high school days studied in Miami University at Oxford in '64 and '65. After serving as a "hundred-day man" with the 131st Ohio Volunteer Infantry, he entered Dartmouth College, from which he was graduated in '67 with an A.B. degree and no definite plans as to the future.

Agriculture had absolutely no appeal for him, although he appreciated the value of his case-hardening and muscle-toughening days on the farm. So he accepted a job of toll-keeper on the canal. This toll-keeper's job, paying five hundred dollars a year, was the only one he could find which didn't involve a plow. Soon he grew restless and dissatisfied with its lack of opportunities. So he hung up a sign, "Coal and Wood," although he had no coal or wood for sale; and then, when the first buyer came along, he rushed the order to a local dealer to be filled.

As time went on his fuel business grew, and after about six years he made a smart move toward cornering Dayton's coal-and-wood trade.

Supplies of coal for Dayton at that time were shipped from the mines a hundred miles away. However, they were carried on railroad tracks covering double this distance, thus materially increasing the price of the coal to Dayton householders. Smelling an opportunity, Mr. Patterson organized with his brothers (Stephen and Frank) the Dayton and Southeastern Railroad. Running from Jackson County to Dayton this railroad converted the previous 300-mile run into one of only a 116 miles. Coal prices went down.

Encouraging results were immediate and gave the Patterson brothers such a head start on other coal dealers that in eight years' time they controlled about 60 per cent of all Dayton's coal business. Insisting on "honest weight" and "clean delivery" were other contributing factors to the success of the firm.

But in spite of the satisfactory volume of business they carried on, the Patterson brothers continually lost money. They couldn't figure it out. Discouraged, the brothers shed an aura of blue which attained deeper and deeper tones.

Such was the situation when one day an agent dropped in and showed them a contraption which he called a "cash register." The Patterson brothers gave it a trial, and found that their consistent losses immediately disappeared. The same thing happened in their retail office, when one of these new-fangled recording contraptions was installed there. The brothers' respect for the device became profound.

As impressed as they were with this new device, though, they were even more impressed—especially John—by tales of the opportunities in the Golden West.

After following Horace Greeley's advice, and undertaking a ranching venture, Mr. Patterson met a retailer in Colorado Springs, who had been so successful with the use of a cash register (after an experience similar to Patterson's) that he was taking a vacation.

This chance conversation was apparently the cause of the brothers Patterson's return to Dayton and their purchase, for $6,500, of the stock of the cash register manufacturing company (the original cash register had been patented in 1879 by one Jacob Ritty, who sold out in 1882 to the National Mfg. Co. of Dayton).

For five years he and his brothers went through a terrific struggle for survival. Their original capital of $15,000 was anything but a comfortable sum, and bankers were unwilling to lend much assistance to a concern engaged in the manufacture of so questionable (at that time) a product.

Though constant experimentation gradually succeeded in improving the machine, time and again the company almost had to close shop because of service difficulties with the registers. Not only did business men all over the country seem to have little use for this product, but poor construction of earlier models meant that many machines had to be returned—with subsequent, and almost fatal, losses to the company.

But in spite of reverses, adversity, and telling discouragement, the business grew, and it eventually became necessary to construct a larger building, which was erected on the old "Rubicon" farm where the Patterson brothers had boyhooded. By 1892 everything seemed hunky-dory. But in that year at least 50,000 imperfect machines were returned, and the business had to mark time until the "bugs" could be taken out of the production line. Mr. Patterson, unable to discover the cause of the trouble, finally moved his desk out into the main room of the factory.

He found that the working and living conditions of his men were bad, and that there was an expensive turnover among employees. So he went to work to clean the place up, whitewashing walls, and improving lighting and ventilation.

Rest rooms were established; rubbish piles were hauled away and vines and shrubbery were planted outside the buildings. Precautions for safety of employees were taken. Very soon the rapid turnover slowed up to a more normal pace, employee morale jumped to a new high, and in consequence few cash registers came back to Dayton.

Later there came playgrounds and gardens, workers' clubs, recreational programs, classes for employees and their families, a community hall, a hospital, and a library. Says B. C. Forbes:

"John H. Patterson, who built America's first model mammoth industrial plant, was a pioneer in interesting workers' families in the company's activities and in doing kindly things for workers' children—garden clubs and the like."

He was decorated with the Legion of Honor by the French Government, and received the Dr. Louis Livingston Seaman Gold Medal from the American Museum of Safety for his work in industrial hygiene and safety.

Realizing that in the end contented customers were the best salesmen, Mr. Patterson did all in his power to satisfy them in every way, and *keep* them satisfied.

The money he spent on research in 1908 amounted to over a quarter of a million dollars, and in the same year there were five experimental departments maintained, utilizing the services of 103 skilled mechanics.

Perhaps this was simply a part of his psychology, expressed in the words, "We progress through change," which he later caused to be inscribed on one of the chimneys of his factory.

* * *

Feet on the Desk

A bundle of energy himself, Patterson was not appalled at the sight of one of his men parking a pair of No. 10 brogans on a desk—that is, not if the man were a supervisor, foreman, manager, or executive.

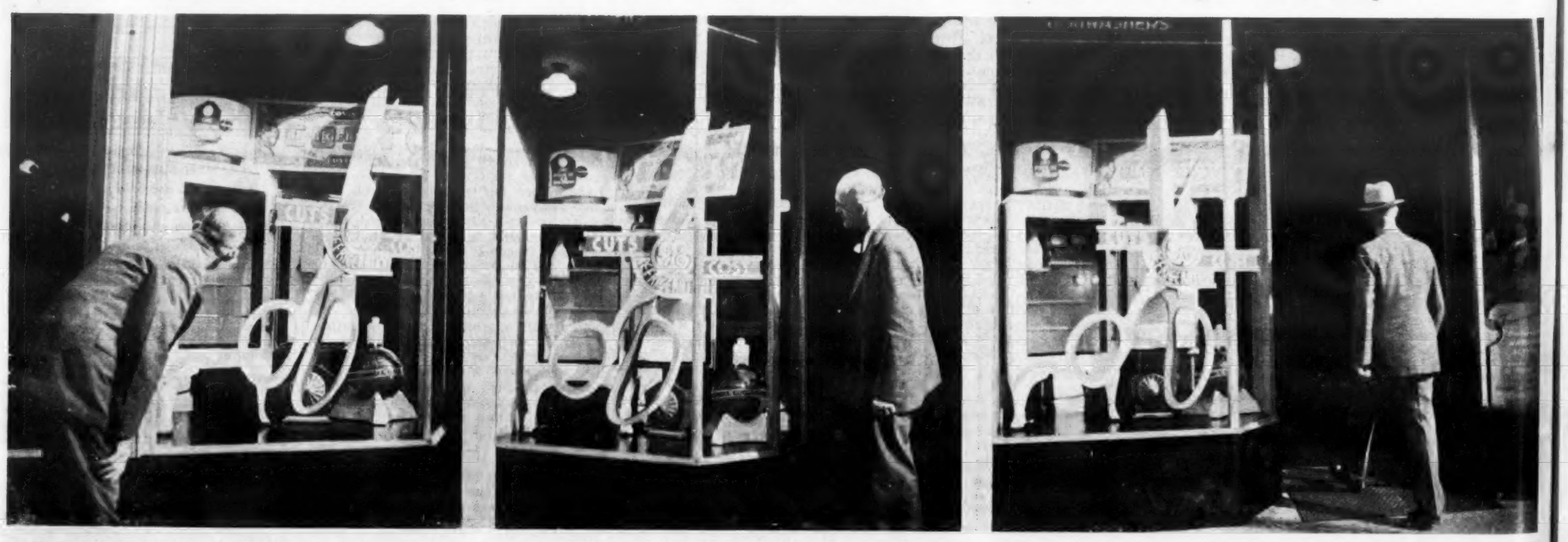
"The biggest discovery I ever made," he once told a friend, "was that when you hire four men to do some work, you must hire a fifth to do the thinking for them."

His executives were not praised for "putting a shoulder to the wheel." Rather, they were supposed to stand off a little distance from the wheel, and try to think of an easier way to turn it.

Three Studious Detroit Engineers

Three Detroit cronies of the refrigeration engineering profession were caught by the candid camera while pondering over new gadgets for 1936 products. (1) John Wyllie, Temprite sales manager and president of the Detroit Chapter, A.S.R.E. (2) M. C. Terry, who has been a machine designer and executive engineer for both Westinghouse and Kelvinator. (3) Frank West, inventor of the Shelvador and more than a dozen other ingenious devices now incorporated in modern electric refrigerators.

Bogart's 'Dollar-Slicing' Window Display Entices Customer through Doorway



H. E. Bogart, Toledo distributor for General Electric products, installed this G-E window display (which incorporates a huge pair of moving shears) in his retail store window a fortnight ago, and has experienced a startling rise in the curve of his store traffic since that time. When the editor came along with a camera he found a prospect so interested in the display that said prospect took two good looks, put on his hat, and walked inside to get further information.

THE NEWSPAPER OF THE INDUSTRY

WRITTEN TO BE READ ON ARRIVAL

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RMA Considers Standardization For Equipment

Tests for Condensing Units To Be Proposed at Meeting Oct. 11

CHICAGO—Initiation of a broad equipment standardization program, to be recommended by its executive and standards committees, will mark the annual meeting of the Refrigeration Machinery Association, to be held at the Palmer House here on Friday, Oct. 11.

The program, preparation of which has been intensively carried on by the RMA standards committee during the past several months, will propose that equipment manufactured by members of the association be divided into seven general groups, the standardization work within each group to be placed in the hands of sub-committees qualified by experience and interest to develop basic standardization.

One standards code of particular significance to the industry, to be considered at the meeting, proposes standard methods for testing mechanical condensing units. This code was prepared by a joint committee, composed of representatives of RMA, American Society of Refrigerating Engineers, and American Society of Heating and Ventilating Engineers.

Adoption of basic standards of this nature, believe its sponsors, will enable the industry to progress from a sound foundation.

"The necessity for reasonable equipment standardization, in the interest of both the producer and consumer, cannot be minimized," says D. Norris Benedict of Frick Co., president of the association.

"The manufacturers producing refrigerating machinery should keep pace with the constant trend of all industry toward standardization. The various technical societies and committees interested in refrigeration have been active in studying and recommending the adoption of codes of standards, and their assistance has been invaluable in making progress possible."

Lipman Names Davenport & Muskegon Distributors

BELOIT, Wis.—Two new distributors have been appointed by the General Refrigeration Sales Co. here, manufacturer of Lipman commercial refrigeration and air-conditioning equipment.

The new distributors are the Uchtorff Weiser Co., Davenport, Iowa and the Peterman Electric Co., Muskegon, Mich. Paul V. Lennan, formerly connected with the Lipman distributor in the Davenport territory, will be in charge of refrigeration sales for the Weiser company.

Manufacturers Pay U. S. $629,921 in August

WASHINGTON, D. C.—Mechanical refrigeration manufacturers paid taxes of $629,921 in August of this year as against $492,714 paid the same month last year, according to figures released by the Bureau of Internal Revenue of the Treasury Department. Tax payments by radio and phonograph record makers totaled $319,331 in August, 1935.

Graybar Takes over Atlanta Branch Of Kelvinator

ATLANTA—Distribution of Kelvinator products in the Georgia territory has been transferred from the present factory branch here to the Graybar Electric Co. at 167 Walton St., the move being effective Oct. 1.

A separate Kelvinator department will be maintained by the Graybar company, and practically the entire personnel of the factory branch will be associated with Graybar to carry on the new department's program without any essential change.

George T. Bryant, who has been in charge of the branch, will now be manager of the Kelvinator department. Others who are joining the Graybar organization are Otis Horne, commercial salesman; R. B. Walker, domestic salesman; H. E. Carroll, service manager; and W. H. Madden, in charge of parts.

John Underwood, southeastern district air-conditioning engineer for Kelvinator Corp., will continue to serve this territory and will have his headquarters in the Graybar building.

Tecumseh Markets 2-Cyl. Compressor

TECUMSEH, Mich.—Tecumseh Products Co. is introducing a two-cylinder compressor, using many of the same parts as the single-cylinder reciprocating type unit which the company has been manufacturing for the past three years.

Both one and two-cylinder compressors are sold separately as well as on the complete condensing units made by the company.

The compressors have a bore and stroke of 1-7/16 in., with gravity feed lubrication to main bearings, force feed to eccentric and wrist pins, and positive lubrication of piston in cylinder by a newly developed oil reservoir in the cylinder, which lubricates the piston at every stroke. Seal gravity feed is also lubricated.

A feature of the design is that intake and exhaust valves are on the same valve plate. The seal is held concentric with the shaft by locating the seal nose, spring, and flange in counter-bores, which are themselves held concentric with the shaft.

Shaft and wrist pin are made from chrome nickel steel.

Delco Announces Shifts In Sales & Service Staffs

DAYTON—Frank H. Prescott, president of Delco Products Corp., last week announced the transfer of E. D. Madden, assistant sales and service manager, to the Sunlight Electrical division of the company at Warren, Ohio, where Mr. Madden will assist John B. Estabrook, president and general manager of the Sunlight Electrical Co., in a sales and service capacity.

As a result of the transfer of Mr. Madden, J. N. Tilbrook, sales engineer in the Detroit offices of Delco Products, has been called to the home offices at Dayton to act as assistant to R. L. Wilkinson, general sales manager.

R. O. Yost, who has spent several years in the technical department of Delco Products, becomes service manager.

ACMA Drafts Air Conditioner Ratings & Tests

Air-Conditioning Makers To Consider Standards For Installation

WASHINGTON, D. C.—Standards for rating and testing air-conditioning equipment, prepared under the direction of the engineering standards committee of the Air Conditioning Manufacturers' Association, will soon be ready for submission to ACMA members for approval.

The standards are the work of a joint committee on rating commercial refrigerating equipment, representing the American Society of Refrigerating Engineers, American Society of Heating and Ventilating Engineers, National Electrical Manufacturers Association, Refrigerating Machinery Association, and ACMA.

They are the first of a series of recommendations, expected to fill a long-felt need in the industry by establishing broad and effective standards for the guidance of both manufacturers and users of air-conditioning equipment.

Since its formation about 18 months ago, ACMA has been active in working toward standardization of the installation and application of air conditioning, in an effort to avoid the abuse of public confidence from which other rapidly-growing industries have suffered in the past.

Present members of the association are: Carrier Engineering Corp., De La Vergne Engine Co., Frigidaire Corp., General Electric Co., Kelvinator Corp., J. H. McCormick & Co., John J. Nesbitt, Inc., Parks-Cramer Co., B. F. Sturtevant Co., Westinghouse Electric & Mfg. Co., and York Ice Machinery Corp.

Nema Meeting Opens Sunday in Chicago

CHICAGO—Annual fall meeting of the National Electrical Manufacturers Association will be held at the Palmer House here starting next Sunday, Oct. 6, and continuing until Friday.

Practically all of the sections and groups affiliated with the Nema organization will hold meetings some time during the five-day period. With the exception of the meeting of the Policies Division, to be held at 9 p. m. Wednesday, Oct. 9, in the hotel's Red Lacquer Room, all sessions will be

(*Concluded on Page 2, Column 5*)

Wholesale Radio Service Opens Chicago Branch

CHICAGO—Wholesale Radio Service Co., Inc., jobber of radio and refrigeration parts and supplies, has opened a branch office at 901-911 West Jackson Blvd. here. The firm has other branches in the Bronx, New York City, Newark, and Atlanta.

The Chicago branch office occupies more than 20,000 sq. ft. of floor space, and is equipped with a large stock of refrigeration replacement parts, all-wave and short-wave radio receivers, short-wave transmitters, and amateur and radio service parts. Shipments will be made from this office to customers in the west and middle west.

General manager of the new store

(*Concluded on Page 2, Column 4*)

Information on Parts Of Condensing Units Featured This Week

Compressors, condensers, refrigerants, and compressor lubricating oils get the call for special editorial treatment in this issue of ELECTRIC REFRIGERATION NEWS.

On page 4 will be found information on new developments in the design and manufacture of condensing units. Articles dealing with the proper construction, installation, and care of compressor parts are published on pages 5 and 6.

New and pertinent information on condensers for household refrigeration units will be found on page 9.

The section which concerns itself with refrigerants and lubricating oils starts on page 10 and continues through page 14, and the information published is about methods of handling refrigerants, and present-day methods and problems in the lubrication of refrigeration and air-conditioning units.

Next week's issue will put editorial emphasis on the proper operation, care, and servicing of motors and controls.

New Diceler Model Innovation in Design

GREENVILLE, Pa.—Several new features in compressor design are incorporated in Deissler Machine Co.'s new model 6000B 4-cylinder condensing unit for air conditioning, dairy applications, and multiple commercial installations.

The compressor is of the standard reciprocating type with four cylinders in line, having 3 1/16-inch bore, and 3¼-inch stroke. Suction and discharge valves are of the latest disc type which allows gas to pass through on all sides.

Built into the discharge valve is a special overload relief. If oil or liquid refrigerant should be pumped through this valve an additional heavy safety spring permits the entire assembly to be raised under the excess pressure to prevent any injury to the compressor.

A section is cut out of the side of the piston and a passage provided up through the piston head. There is no opening from the upper section of the piston through to the crankcase. The incoming gas enters through a port in the cylinder wall and passes up through the piston suction valve.

There are two suction openings provided—one opening feeding the two front cylinders, and the other opening feeding the two back cylinders. These connections are fitted with strainers to prevent dirt from entering the compressor and are designed to accommodate standard valves.

When required a manifold is furnished to connect the two openings. This manifold can be furnished to accommodate one or two suction valves as may be required.

Oil is separated in these suction openings and two drain holes permit the oil to return to the crankcase. A conventional gauge glass on the crankcase permits visual inspection of the oil level at all times.

The crankshaft is provided with adjustable Timken roller bearings for the main shaft, and removal of a small plate on the rear bearing casting permits easy adjustment of the bearings.

The special design of the crank-

(*Concluded on Page 4, Column 4*)

Sales in 8 Mos. Top All-Time Annual Record

120,700 Sales In August Puts Industry Ahead of Total for 1934

DETROIT—World sales of household electric refrigerators by manufacturers to distributing outlets through the first eight months of 1935 totaled 1,465,700, a greater number than the all-time *yearly* sales record of 1,390,600 units sold in all of 1934, according to estimates just compiled by ELECTRIC REFRIGERATION NEWS.

August sales of 120,700 units by all industry manufacturers set a new high for the month, eclipsing the record of 98,100 units established in 1933.

July world shipments of household electric refrigerators by 14 members of the Household Refrigeration Section of the National Electrical Manufacturers Association (Nema) totaled 109,834 units.

For the first eight months of 1935 Nema member companies have sold 1,333,952 household electric refrigerators, as compared with 1,082,855 units sold in the similar period last year.

In the sales-by-states tabulation of shipments to dealers and distributors, New York state was again far out in front, receiving approximately 19 per cent of all the refrigerators shipped. California was second, Illinois third, and Pennsylvania fourth.

Reports from 19 member companies of the Commercial Refrigeration Section of National Electrical Manufacturers Association showed world sales of commercial condensing units by these companies in August to total 10,381 units, only a slight decline from the peaks reached in June and July.

Companies reporting to the Household Refrigeration Section in August were Apex, Crosley, Frigidaire, General Electric, Gibson, Kelvinator, Leonard, Norge, Servel, Stewart-Warner, Sunbeam, Uniflow, Universal Cooler, and Westinghouse. Nema members not reporting were Jomoco, Merchant & Evans, and Sparks-Withington. Refrigeration units made by Nema members for Major Appliance Corp., Montgomery Ward, Potter Refrigerator Corp. (Nema member), Sears, Roebuck & Co., and Truscon Steel Co. are included in the Nema total.

Eva McPherson to Direct Kelvinator Home Service

DETROIT—Miss Eva McPherson has been appointed head of the home economics department and the Kelvin Kitchen of Kelvinator Corp., replacing Miss Polly Peacock, resigned, reports S. C. Mitchell, director of advertising and sales promotion for Kelvinator.

Miss McPherson has been a traveling representative of Kelvinator's home economics department since September, 1931. In this position she worked with distributors and dealers in developing sales promotion plans, conducting cooking schools and food store demonstrations. She has been working with utility outlets in the South for the past two years.

Before entering the service of Kelvinator Corp., Miss McPherson was home economist for the Kelvinator distributorship in Buffalo.

Lunch-Time Is Conference-Time for General Electric Specialty Appliance Executives

A company-operated restaurant provides a spot for daily conferences of General Electric specialty appliance department executives. (1) Art Scaife, manager of advertising and sales promotion, is stopped by the halloo of a fellow-worker on his way to lunch. (2) Ralph Cameron, manager of the department store division, joins Art for the walk over to the restaurant. (3) Salesmanager "Mike" Sweeney and a visiting fireman enter the group. (4) Art is the last one in. (5) Back at his desk, after a good meal and an inspiring exchange of ideas.

Sales Idea of the Week

By V. E. (Sam) Vining, Director of Department Store Sales, Westinghouse Electric & Mfg. Co.

Says Edith, the other day; "The Quality of Merchandising is not Strained."

Proving that she knows her Shakespeare, and that her husband is one of the best merchandisers I have ever known—possibly because the lights were dim and she couldn't see exactly what she was getting when she promised to marry him and call it a night.

Anyway, her semi-quotation brought me up with a jolt.

I thought of the barber who cuts my wife's hair and insists on being called a "Hair Stylist." I thought of the Pharmacy down the street that calls itself a "Drug Shoppe."

I thought of the thousands of roadside stands calling themselves "Do-Drop-Inn," "Bar-B-Q," and other Bromidic attempts to be Sulphuric.

I thought of the old traveling man's rule never to stop at a hotel named "Grand," or "Palace," or the "*New* Somethingor-other" if it could be avoided;

And, I wondered if I too had been striving to be clever—striving to impress people rather than sell them what they needed. I wondered just how many sales I had lost in my life because I was trying to imitate the Man on the Flying Trapeze, rather than be of actual service to my prospect.

I wondered if I too had been trying to be clever—to the point where my efforts were "Strained."

Thanks, Edith, for the thought—I needed it.

G-E Holding Series Of Regional Meets

CLEVELAND—For the purpose of outlining to distributor executives the 1936 advertising and sales promotion campaigns on General Electric products, a series of regional meetings is being conducted throughout the country.

Men in charge of the meetings are W. R. Baker, vice president of Maxon, Inc., advertising agency; A. L. Scaife, manager of advertising and sales promotion for General Electric Co.; J. R. Poteat, range division manager for General Electric Co.; and Carl M. Snyder, dishwasher division manager for General Electric Co.

Regional meetings were started at Boston, New York, and Philadelphia. Other meetinsg are to be held at Atlanta, New Orleans, Dallas, St. Louis, Chicago, Minneapolis, Omaha, Denver, Salt Lake City, Seattle, Portland, San Francisco, and Los Angeles.

Conference programs will include discussions of newspaper, outdoor, radio, direct mail, and magazine advertising and sales promotion.

Moore Co. Holds Previews Of Stewart-Warner Lines

SAN FRANCISCO—Moore Electric Co., Stewart-Warner refrigerator and radio distributor here, has held dealer previews of the new lines in San Francisco, Sacramento, Oakland, and San Jose.

Sales organization of the distributing company has been rearranged as follows: Al Aamodt, Sacramento territory; Don Anderson, Modesto territory; Ed Huber, San Jose and the south coast; Frank Helderle, Fresno; and Sales Manager Christianson, San Francisco. The Oakland and north coast territory remain unchanged.

Sales Contests & How to Run Them

NO. 9—PRIZES FOR MAKING QUOTA GIVEN FIRST AND THEN SALESMEN MUST MAKE QUOTA OR GIVE UP PRIZE

By John Kumler, Sales Contest Manager Buckley, Dement & Co., Chicago

Super Maid Cook Ware tried this plan a few years ago when electric clocks were new and very desirable.

The put 134 fine electric mantle clocks right in the homes of their branch managers with the distinct understanding that "they come back to us if you don't make your quota for this month."

Being a useful novelty, and an item that got attention many times a day, the reminder was perfect.

All but six men made their quota that month (less than half had done so the previous month) and those six all tried to buy the clock rather than to let it get away.

While it's true that very few items fit this plan so well as the clock, the principal of the plan—the giving of a nice gift with its retention being based on specified results for a stated period—can be applied with most any desirable prize.

FHA Loans for Week of Sept. 21 Reach Total Of $14,420,375

WASHINGTON, D. C.—Financial institutions throughout the country did a business of $14,420,375 in modernization and repair notes insured and in home mortgages selected for appraisal during the week of Sept. 21, reports Federal Housing Administrator Stewart McDonald.

Modernization and repair notes issued during the week numbered 21,485, for a total of $7,455,878, taking into consideration both the $2,000 and $50,000 classifications of Title I of the National Housing Act. Mortgages selected for appraisal totaled 1,858, with a value of $6,964,497.

Business done by FHA agencies to Sept. 21 totaled $331,486,367, of which $159,285,673 was insured modernization and repair notes and $172,200,694 mortgages chosen for appraisal.

The increase in FHA business, Mr. McDonald said, is in line with building reports made to the Bureau of Labor Statistics of the Department of Labor, which show that construction of all types in August reached the highest monthly peak since Oct., 1931.

New residence construction in August was greater than for any month since October, 1931, with the exception of June, 1935, and showed a marked gain over July figures.

Reports from 742 cities, representing the nine geographical divisions of the country, showed a gain in new residence construction for August of $18,515,475, or 207.6 per cent, over August of last year. Gain in number of operations for the month was 178.6 per cent, or 3,644 new residences.

The east south central section showed the largest percentage of gain, with an increase of 737.4 per cent over August, 1934.

Cities which showed more than $500,000 worth of residential construction during the month were: New York City, $1 554,300; District of Columbia, $1,199,300; Los Angeles, $1,122,961; Detroit, $918,643; Philadelphia, $756,200; and Houston, $504,470.

'New American' Homes Opened in Detroit

DETROIT—Five "New American Homes," embodying new developments in room arrangement and architectural style, were officially opened to the Detroit public Sunday.

The homes, outgrowth of a nation-wide architectural competition sponsored by General Electric Co. last winter, are equipped with year-'round air-conditioning systems and all-electric kitchens.

Sponsors of the program here are Caswell, Inc., Michigan General Electric distributor; Reid Construction Co., builders; O'Dell, Rowland, Shreve, Anderson, and Walker, supervising architects; Stran Steel Corp., frame work construction; Air Conditioning Corp., air conditioning and heating; and Fred Blackwood Co., selling agents.

Many inquiries concerning the homes have been received from people who plan to build during the next few months, reports Wallace E. Reid, vice president and general manager of Reid Construction Co.

The homes are located at 15309 Artesian St., 3221 Woodstock St., 750 University Pl., 8590 Birwood St., and 18434 Roselawn St.

Wholesale Radio Opens Chicago Service Branch

(*Concluded from Page 1, Column 3*)

is S. W. Berk, formerly floor manager of Wholesale Radio's main office at 100 Sixth Ave., New York City, and one-time manager of the Atlanta branch of the firm. Marvine Roye is purchasing agent, and J. E. Snyder, office manager. On the technical staff are Arthur Rattray, Ed DeCancq, John Morgan, Earl Ruleson, and Edward Hoffman.

Coincident with the opening of the Chicago office, Wholesale Radio has issued a 196-page fall catalog of radio and refrigeration parts, listing a large number of individual items designed to help radio and refrigeration dealers in their service and repair work.

Stewart-Warner Sales Running 20% Ahead Of 1934—J. E. Otis

CHICAGO—Sales by Stewart-Warner Corp. and its subsidiaries for this year are running approximately 20 per cent ahead of 1934, President Joseph E. Otis, Jr. announced last week. For the September quarter, sales lead the corresponding period of last year by about 25 per cent.

A particularly encouraging showing has been registered this year by the company's radio and refrigeration divisions, Mr. Otis said. The drop in sales during summer months was somewhat less than last season, he added; and the second quarter of this year is expected to show a sizeable profit, compared with a net income of $25,523 in the third quarter of 1934.

The company's balance sheet, Mr. Otis reports, continues to show a strong financial position, with a working capital ratio of better than five to one on Aug. 31, and with cash on hand in excess of $2,750,000.

Refrigeration Divisions Of Nema to Meet

(*Concluded from Page 1, Column 3*)

open only to members of the groups concerned.

The Household Refrigeration Section of the Refrigeration Division will meet at 9:30 a. m. Wednesday, Oct. 9, with Thomas Evans, president of Merchant & Evans Co. and chairman of the division, in charge. J. A. Harlan, commercial sales manager of Kelvinator Corp., and chairman of the Commercial Refrigeration Division, will preside over that group when it meets at 9:30 a. m. Thursday, Oct. 10.

Group and section meetings scheduled for the week include:

Monday, Oct. 7: Fractional Horsepower Motor Subdivision of the Motor and Generator Section, 8 p. m.

Tuesday, Oct. 8: Electric Shows and Exhibits Committee, 9:30 a. m.; Food Service Equipment Section, 9:30 a. m.; joint meeting of appliance manufacturers — Domestic Appliance, Electric Water Heating, Food Service Equipment, Electric Range, and Fan Motor sections, 8 p. m.

Wednesday, Oct. 9: Electric Range Section, 9:30 a. m.; Household Refrigeration Section of the Refrigeration Division, 9:30 a. m.; Policies Division (Red Lacquer Room), 9 p. m.

Thusday, Oct. 10: Commercial Refrigeration Section, 9:30 a. m.

Two Firms Cooperate in Ring Manufacture

BALTIMORE—Under terms of a recent contract, American Hammered Piston Ring Co. and the Skinner Chuck Co., New Britain, Conn., are cooperating in the manufacture and sale of Gold Seal and Silver Seal piston rings. The rings, fitted with peripheral metal inserts, are used in Diesel engines, compressors, and refrigerating machinery.

Gold seal rings have bronze inserts around the periphery, and are used in internal combustion engines of all types, such as steam engines and compressors. Silver Seal rings, fitted with babbitt or similar white metal alloy, are used in refrigerating machinery, where ammonia or other chemical prevents the use of bronze.

This type of ring is used at present by Westinghouse Electric & Mfg. Co. in its Diesel engines, and by Frick Co. in its high-capacity refrigerating machinery.

STATISTICS

14 Manufacturers Sell 109,834 Household Electric Refrigerators to Distributors & Dealers during August, 1935

The following 14 member companies of the Refrigeration Division of the National Electrical Manufacturers Association (Nema) reported household refrigerator sales for August, 1935: Apex Electrical & Mfg. Co., Crosley Radio Corp., Frigidaire Corp., General Electric Co., Gibson Refrigerator Corp., Kelvinator Corp., Leonard Refrigeration Co., Norge Corp., Servel, Inc., Stewart-Warner Corp., Sunbeam Electric Mfg. Co., Uniflow Mfg. Co., Universal Cooler Corp., and Westinghouse Electric & Mfg. Co. Member companies not reporting included: Jomoco, Inc., Merchant & Evans Co., and Sparks-Withington Co.

The sales of the reporting companies do, however, include units manufactured for the following concerns: Major Appliance Corp., Montgomery Ward & Co., Potter Refrigerator Corp., Sears, Roebuck & Co., and Truscon Steel Co.

	SALES FOR AUGUST, 1935					
	Domestic		Canadian		Other Foreign	
Lacquer (Exterior) Cabinets Complete	Quantity	Value	Quantity	Value	Quantity	Value
1. Chest	2,082	$ 101,615	29	1,409	154	$ 7,852
2. Less than 3.00 cu. ft.	130	8,123	.....	.....	17	877
3. 3 to 3.99 cu. ft.	4,168	238,399	157	8,905	1,342	76,583
4. 4 to 4.99 cu. ft.	23,763	1,534,853	361	25,635	3,249	210,686
5. 5 to 5.99 cu. ft.	23,402	1,817,770	84	6,660	972	74,155
6. 6 to 6.99 cu. ft.	13,118	1,169,877	147	13,088	601	55,905
7. 7 to 7.99 cu. ft.	7,084	769,525	136	15,191	345	35,723
8. 8 to 9.99 cu. ft.	1,861	211,437	13	1,441	103	12,204
9. 10 to 12.99 cu. ft.	44	8,251	.....	.....	.....	.....
10. 13 cu. ft. and up	8	1,839	.....	.....	.....	.....
11. **Total Lacquer**	**75,660**	**5,861,689**	**927**	**72,329**	**6,783**	**473,985**
Porcelain (Exterior) Cabinets Complete						
12. Up to 4.99 cu. ft.	570	42,179	48	4,656	193	14,987
13. 5 to 5.99 cu. ft.	2,878	251,657	6	511	306	27,328
14. 6 to 6.99 cu. ft.	3,261	334,797	3	305	176	19,295
15. 7 to 7.99 cu. ft.	2,916	345,205	12	1,392	214	26,867
16. 8 to 9.99 cu. ft.	1,521	218,415	2	271	112	16,061
17. 10 to 12.99 cu. ft.	479	85,284	.....	.....	50	9,076
18. 13 cu. ft. and up	204	48,851	2	504	15	3,402
19. **Total Porcelain**	**11,829**	**1,326,388**	**73**	**7,639**	**1,066**	**117,016**
20. **Total Lines 11 and 19**	**87,489**	**7,188,077**	**1,000**	**79,968**	**7,849**	**591,001**
21. Separate Systems ¼ Hp. or Less	12,463	530,104	.....	.....	614	35,964
22. Separate Household Evaporators	295	5,811	39	629	85	1,917
23. **Total Lines 20, 21, 22**	**100,247**	.....	**1,039**	.....	**8,548**	.....
24. Condensing Units ¼ Hp. or Less	471	28,337	22	1,365	657	40,374
25. Cabinets—No Systems	102	8,272	.....	.....	31	3,801
26. **Total Household**	.....	**$7,760,601**	.....	**$81,962**	.....	**$673,057**

Exports of Electric Refrigerators

July, 1935, Shipments Reported by the Bureau of Foreign and Domestic Commerce, Washington, D. C.

	Electric Household Refrigerators		Electric Commercial Refrigerators Up to 1 Ton		Parts for Electric Refrigerators
	Number	Value	Number	Value	Value
Austria	83	$ 5,949	5	$ 503	$ 684
Azores and Madeira Islands	3	416	...	...	...
Belgium	229	17,236	64	4,643	7,781
Czechoslovakia	15	1,066	...	...	7,944
Denmark	1	143	...	...	3,344
Finland	45	3,252	12	1,270	4,829
France	1,395	96,846	134	12,647	32,472
Germany	3	287	...	...	7,617
Gibraltar	4	323	...	...	...
Greece	16	1,297	13	1,412	2,420
Irish Free State	54	4,332	6	621	891
Italy	68	5,132	20	1,624	3,455
Malta, Gozo & Cyprus	2	149	...	...	...
Netherlands	283	17,694	52	4,692	11,613
Norway	19	1,224	15	1,442	1,970
Poland and Danzig	10	456	...	...	470
Portugal	32	2,804	19	2,033	1,355
Rumania	4	343	...	...	...
U.S.S.R. (Russia, Europe and Asia)	8	1,351	1	390	...
Spain	336	26,709	34	4,612	3,171
Sweden	253	18,440	27	2,427	3,405
Switzerland	100	5,809	...	...	3,277
United Kingdom	1,563	112,339	414	22,635	53,346
Yugoslavia	20	2,193	13	2,018	51
Canada	84	6,638	117	12,319	38,633
Costa Rica	7	716	...	...	140
Guatemala	10	1,072	...	...	20
Honduras	20	1,697	...	...	477
Nicaragua	...	...	1	178	1
Panama	82	6,831	9	1,453	1,860
Salvador	2	212	1	583	96
Mexico	254	22,732	22	4,885	3,420
Newfoundland and Labrador	17	1,451	3	295	...
Bermuda	116	11,262	...	...	498
Barbados	9	978	...	...	45
Jamaica	5	376	...	...	65
Trinidad and Tobago	40	5,212	4	354	64
Other British West Indies	12	1,020	...	...	63
Cuba	374	34,480	54	8,864	5,636
Dominican Republic	...	...	...	...	19
Netherland West Indies	60	5,439	8	1,473	1,062
French West Indies	6	440	...	...	162
Haiti, Republic of	10	649	...	...	396
Argentina	1,377	67,673	232	21,852	10,117
Bolivia	6	508	...	...	6
Brazil	282	23,870	65	8,125	10,749
Chile	9	816	...	...	13
Colombia	84	8,037	14	2,532	1,109
Ecuador	14	1,038	...	...	128
British Guiana	...	...	...	...	67
Surinam	7	437	...	...	12
Paraguay	2	101	...	...	92
Peru	18	1,284	...	...	1,244
Uruguay	37	2,402	...	...	2,476
Venezuela	152	12,543	5	991	291
Aden	27	1,534	...	...	...
British India	239	22,053	19	2,144	13,412
British Malaya	77	6,975	7	950	11,071
Ceylon	9	833	...	...	...
China	95	8,691	10	1,614	4,418
Netherland India	239	22,020	3	303	2,949
French Indo-China	90	6,872	...	...	281
Hong Kong	91	8,108	6	700	700
Japan	5	563	12	1,890	4,612
Palestine	341	26,072	20	3,271	3,739
Philippine Islands	38	2,992	16	2,576	741
Siam	11	728	1	311	20
Syria	20	1,575	5	1,715	223
Turkey	21	1,665	7	870	701
Other Asia	5	487	5	1,219	62
Australia	444	37,249	3	244	44,255
British Oceania	2	202	...	...	50
French Oceania	2	147	1	1,183	42
New Zealand	491	39,920	3	367	2,177
Ethiopia	1	122	...	...	...
Belgian Congo	5	470	...	...	13
British East Africa	2	321	3	543	329
Union of South Africa	1,115	90,511	47	5,110	19,222
Other British South Africa	1	99	...	...	290
Gold Coast	35	3,333	...	...	311
Nigeria	3	435	...	...	165
Other British West Africa	3	371	...	...	73
Egypt	173	14,221	17	2,208	1,406
Algeria and Tunisia	221	16,525	15	1,314	910
Madagascar	...	...	...	...	107
Other French Africa	23	2,251	...	...	969
Italian Africa	5	383	...	...	14
Liberia	1	85	...	...	...
Morocco	83	6,219	3	363	965
Mozambique	3	180	1	98	248
Other Portugal Africa	...	...	3	344	7
Canary Islands	5	558	2	169	98
Other Spanish Africa	76	5,114	...	...	...
Total	**11,644**	**$875,588**	**1,573**	**$156,379**	**$333,626**
Shipments to Hawaii	636	73,274	28	5,393	7,457
Puerto Rico	322	36,915	27	3,504	3,506
Virgin Islands	3	348	...	...	124

New York State Gets 19% of Units Sold in U.S. in August

The following report of sales by 14 manufacturers of household electric refrigerators is a distribution by states of their sales for August, 1935. The companies reporting are listed at the left.

States and Territories	Quantity of Household Low Sides
Alabama	800
Arizona	165
Arkansas	638
California	10,488
Colorado	537
Connecticut	2,647
Delaware	60
District of Columbia	567
Florida	2,163
Georgia	1,718
Idaho	383
Illinois	7,617
Indiana	2,384
Iowa	1,678
Kansas	882
Kentucky	987
Louisiana	690
Maine	425
Maryland	1,206
Massachusetts	4,708
Michigan	5,308
Minnesota	182
Mississippi	516
Missouri	1,794
Montana	470
Nebraska	692
Nevada	119
New Hampshire	269
New Jersey	4,037
New Mexico	52
New York	19,498
North Carolina	411
North Dakota	238
Ohio	5,489
Oklahoma	528
Oregon	661
Pennsylvania	7,009
Rhode Island	631
South Carolina	476
South Dakota	272
Tennessee	1,313
Texas	3,453
Utah	314
Vermont	186
Virginia	677
Washington	1,611
West Virginia	770
Wisconsin	2,504
Wyoming	128
Total United States	**100,247**
Canada	1,039
Other Foreign (Including U. S. Possessions)	8,548
Total for World	**109,834**

10,381 Commercial Units Sold during August by 19 Companies

Commercial sales for August, 1935, were reported to the National Electrical Manufacturers Association (Nema) by 19 companies, some of which are not members of the association. These reports cover the sale of units less than 1 hp. in size. Companies reporting are: Baker Ice Machine Co., Brunner Mfg. Co., Carbondale Machine Corp., Carrier Engineering Corp., Crosley Radio Corp., Frigidaire Corp., General Electric Co., Gibson Electric Refrigerator Corp., Kelvinator Corp., Leonard Refrigerator Co., Norge Corp., Phoenix Ice Machine Co., Reliance Refrigerating Machine Co., Servel, Inc., Uniflow Mfg. Co., Universal Cooler Corp., Westinghouse Electric & Mfg. Co., and York Ice Machinery Corp.

	SALES FOR AUGUST, 1935					
	Domestic		Canadian		Other Foreign	
COMMERCIAL	Quantity	Value	Quantity	Value	Quantity	Value
1. Water Coolers Complete	1,525	$159,486	10	$ 1,190	102	$ 11,661
2. Water Coolers Remote	89	6,202	.....	.....	.....	.....
3. Ice Cream Cabinets Complete	339	40,773	3	413	136	15,522
4. Ice Cream Cabinets Remote	294	41,250	2	274	24	3,402
5. Beverage Coolers Comp.	2,119	151,514	7	455	47	3,334
6. Beverage Coolers Remote	196	15,323	.....	.....	.....	.....
Condensing Units						
7. Less than ⅛ Hp.	869	45,508	27	1,694	214	13,426
8. ⅛ to ½ Hp. Inc.	2,821	251,462	33	2,261	1,058	86,408
9. Above ½ and Less Than 1 Hp.	921	119,357	12	1,666	138	18,424
10. **Total Lines 7, 8, and 9**	**4,611**	.....	**72**	.....	**1,410**	.....
11. **Total Lines 1, 3, 5, 10**	**8,594**	.....	**92**	.....	**1,695**	.....
12. Evaporators	4,040	127,374	102	4,104	862	22,201
13. Miscellaneous Cases and Cabinets	52	11,663	5	300	7	1,810
14. **Total Commercial**	.....	**$969,912**	.....	**$12,357**	.....	**$176,188**

600 Attend Three Meetings Of Connelly Dealers

SEATTLE — Approximately 600 dealers and salesmen attended the three meetings held in Seattle, Spokane, and Portland recently by the F. B. Connelly Co., northwest distributor for Grunow refrigerators and radios.

Speakers at the meetings included Kenneth A. Connelly, vice president and general manager of the Connelly organization; Dr. James D. Jordan, chief research engineer of the General Household Utilities Co.; Carl D. Boyd, western manager for the Grunow company; and W. R. McCurdy, Connelly general sales manager.

CONDENSING UNITS

Brown Traces Development in Compressor Manufacture

By C. M. Brown, Refrigeration Division, Tecumseh Mfg. Co.

IN building compressors and condensing units 10 or 12 years ago it was the object of refrigeration manufacturers to put out a compressor or condensing unit that would hold gas and pump. There was not so much attention, at that time, given to the quietness and efficiency of the unit. A company was considered as doing a good job when they put into the field a product which required, according to our present standards, an abnormal amount of service. It was not at all uncommon to have two to three service calls per year per unit to keep these compressors and condensing units operating properly, but today this picture has changed considerably due to natural progress through changes and the rigid requirements of the customer.

To meet these requirements the refrigeration manufacturers have done a great deal of research work in trying to find out how to make compressors on a high production scale but at the same time having them perform efficiently, quietly, and trouble free from a service standpoint.

A few of the problems which have had the constant attention of the engineering departments are as follows:

(a) Design of compressors to give the minimum amount of service in the field.

(b) High efficiency in operation.

(c) Quietness of operation.

(d) Improvement of materials going into compressors to increase the length of life of compressor.

(e) Methods of machining compressors to close limits on a high production scale.

In the last few years very strict requirements have been put on compressors from a noise standpoint and manufacturers who are building compressors today are required to keep the noise down to such an extent that the refrigeration unit can scarcely be heard while operating.

To accomplish this end we have followed in the footsteps of the automotive manufacturer but we have been required to work into these high production methods a means of holding very close limits as we have found, through experiments, that quietness of compressors is accomplished to a great extent by the precision machining of parts and the proper alignment of parts in the compressor when they are assembled.

For instance, it is very important that the cross bore of the compressor be at right angles with the cylinder bore. It is nothing uncommon to hold this limit today down to tenths of thousands.

Cylinder bore and wrist pin hole in piston and the two holes in the connecting rod are likewise held to very close limits. Some manufacturers hold this limit as close as .0002 in. for size and out-of-roundness.

To make parts with these close limits it has been necessary to develop new methods of machining and most manufacturers have found that in order to hold such close limits the most satisfactory method of accomplishing this end is by diamond boring. These diamond boring machines are very intricate machines and require experienced mechanics to operate them.

Maintaining these close limits also requires a constant checking of parts with very close measuring instruments to see that these limits are held. It is also very important to see that the temperature in the shop is held as nearly constant as possible.

One of the most important developments that has been made, from a machining standpoint, is the diamond turning of the seal face, or seal nose.

This operation a few years ago was done by hand on a lapping block, but now the more up-to-date manufacturing plants have diamond turning machines to do this operation and some plants are equipped with microscopes for examining each seal face after it comes off this diamond turning machine. This has speeded the finishing work on the seal face and has given us a much better job than was ever obtained before. The result has been a greatly reduced number of seal leaks in compressors.

It is readily seen that it is not practical to hold limits less than .0002 inch on any machined part in high production, but it is necessary in fitting parts that they be held closer than the combined tolerance of the two parts which go together.

For instance, in fitting a piston to a cylinder, if the piston has a limit of .0002 inch and the cylinder bore has a limit of .0002 inch and the clearance between the piston and the cylinder should be .0004 of an inch to .0006 of an inch, it can readily be seen that it would be impossible to assemble these parts to the limits specified above as in some cases the piston would not go into the cylinder and in other cases it would be too loose.

Therefore, it is necessary to measure the outside diameter of the piston and the diameter of the cylinder bore and mark this limit on the compressor and the piston so that the proper piston can be selected to give the proper clearance. Likewise, it is necessary to fit the other parts in the same manner.

From a design standpoint a great deal of attention has been given to simplicity, more rigid requirements on finishes, and to better and positive lubrication, which has been a great aid in quieting the compressor.

New materials have been developed, such as a better and more uniform material for the seal nose, improved close grained castings and numerous steel alloys for other parts which must withstand severe usage with a minimum amount of wear. New, improved oils are dry, have less gumming tendencies, and work properly in the complete refrigerator with whatever refrigerant used.

Some manufacturers have designed compressors with force feed lubrication. Refrigeration engineers have found, along with automotive engineers, that it is necessary to get the oil to the proper place at the right time to reduce wear and noise.

An increasing amount of attention is being given to the proper balancing of reciprocating parts to reduce vibration.

The bearing metal manufacturers have also aided the refrigeration engineers by developing new and improved materials; for instance, the seal ring or seal nose material has been improved to such an extent that seal leaks have in some cases been cut as much as 50 per cent. However, in most cases an improved seal design having less friction has been responsible for further reducing the amount of seal leaks after the compressor goes in operation.

Process specifications are more rigid, especially as to running in, volumetric test, cleaning, dehydration, and wattage, valve and leak tests.

Brunner 4-Cylinder Unit Follows Design Of Radial Engines

UTICA, N. Y.—In Brunner Mfg. Co.'s line of reciprocating compressors for commercial applications, models powered by motors in the ¼ to 2-hp. range are 2-cylinder models, and in sizes from 3 to 15 hp., an advanced V-type 4-cylinder compressor is employed.

The four cylinders in the larger models operate with only two eccentrics and two rods, a master and auxiliary rod such as are employed on all radial aeronautical engines.

Advantages of this design, declare Brunner engineers, are that there is a material reduction in the frictional load, resulting in greater compressor efficiency, and fewer parts are needed that are used in conventional designs.

Servicing of Brunner compressor valves is accomplished quickly and easily, claim the engineers, because of the fact that all of the valves are contained in one valve plate assembly. This valve plate is replaced by simply removing the head bolts. The valve leaves are of high grade Swedish steel.

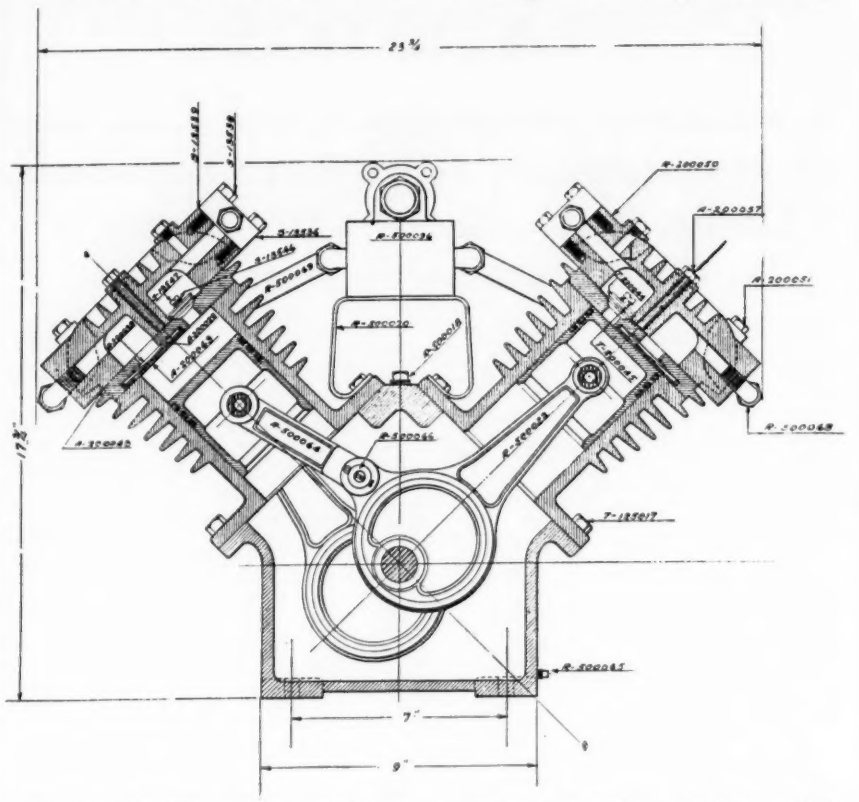
Suction and discharge shut-off valves are both connected to the cylinder head. The head is designed in such a manner that the heat is readily dissipated due to the heat exchanging designing feature of the cylinder head, and the large radiating surface of the fins.

A sylphon bellows seal is employed in Brunner compressors. No abrasives are used in the lapping process. The shaft collar and seal nose are lapped on specially built machines, which use cast iron lapping blocks running in a continuous bath of clean oil.

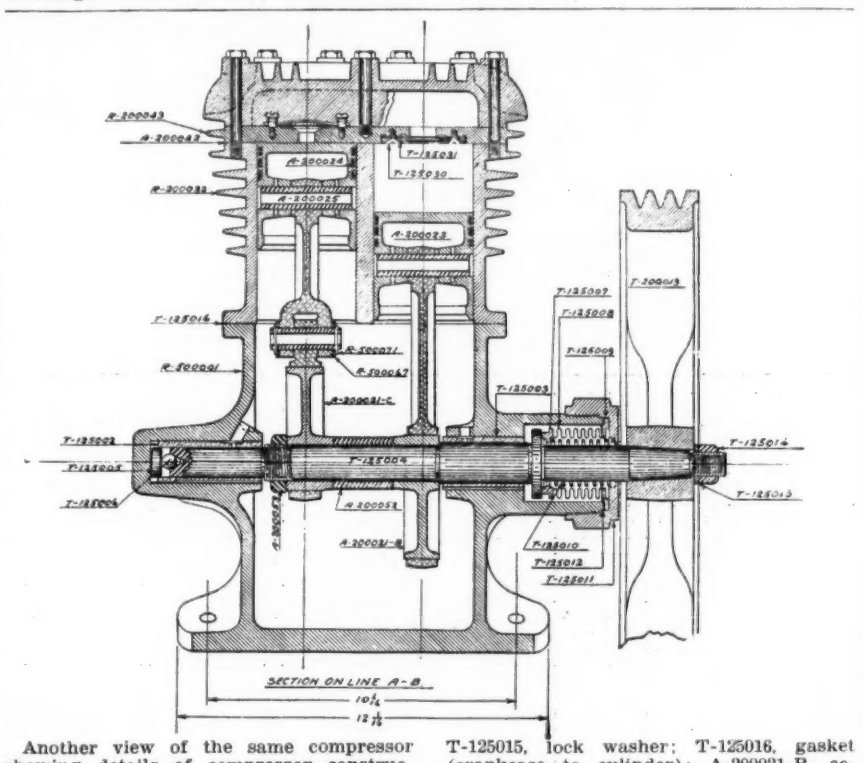
All bearing surfaces and cylinder holes are diamond-bored before honing. Tolerances are kept to very close limits. Every compressor is "run in" on special "running-in" stands, after which it is given a volumetric test before being passed for assembly into a high side.

Use of oversize condensers practically eliminates the possibility of service problems due to excessive head pressures, the engineers claim.

Details of Brunner's Big Compressors



Drawing showing Brunner 4-cylinder compressor, showing details of the design whereby the models operate with only two eccentrics and two rods. Parts shown in this drawing are as follows: T-125017, hex cap screws; A-200028, suction valve; A-200029, suction valve spring; R-500036, suction line valve; S-13536, discharge line valve; S-13538, hex cap screw; S-13539, line valve gasket; T-200044, discharge valve; T-200045, discharge valve retainer; S-13546, discharge valve retainer spring; S-13547, shoulder screw; A-200048, valve-plate-to-head gasket; R-200050, head; A-200051, hex cap screw; A-200057, hex cap screw; A-200063, inlet valve retainer; R-500064, connecting rod; R-500022, eccentric strap; R-500018, oil filler plug; R-500065, drain plug; R-500066, connecting rod pin; R-500067, connecting rod washer; R-50068, elbow connection with flare nut; R-500069, intake manifold; R-500070, suction line valve bracket.



Another view of the same compressor showing details of compressor construction, and seal assembly. Parts are numbered as follows: R-500001, crankcase; T-125002, bushing (small); T-125003, bushing (large); T-125004, shaft; T-125005, thrust slug; T-125006, ball; T-125007, seal nose; T-125008, seal bellows; T-125009, seal back; T-125010, seal spring; T-125011, seal nut; T-125012, seal gasket; T-200013, flywheel; T-125014, nut (¾ S.A.E.); T-125015, lock washer; T-125016, gasket (crankcase to cylinder); A-200021-B, eccentric; A-200021-C, eccentric; A-200023, piston; A-200024, piston ring; A-200025, piston pin; T-125030, machine screws; T-125031, shakeproof lock washer; R-200032, cylinder; A-200042, cylinder-to-valve-plate gasket; R-200043, valve plate; A-200052, eccentric spreader; A-200053, eccentric nut; R-500067, connecting rod washer; R-500071, cotter pin.

Diceler Has New Model

(Concluded from Page 1, Column 4)

shaft provides a positive system of lubrication to connecting rod bearings, etc., by centrifugal force and the constant oil dipping in the crankcase.

A bellows-type shaft seal is self-actuated by means of the crankcase pressure—the higher the pressure the greater the sealing force exerted. A compressor spring exerts sufficient force to keep it closed when the compressor is pumping a vacuum. Special construction keeps the seal housing completely flooded with oil at all times.

A carefully balanced flywheel with six grooves for V-belts is used to drive the compressor.

COMPRESSOR PARTS

Problems in Shaft Sealing and Procedure in Seal Replacement

By W. Meyer, Rotary Seal Co., Chicago

THE problem of sealing around a rotating shaft has always been a difficult one and a source of worry and grief to the designing engineer, as well as to the refrigeration service engineer. With the coming of the mechanical household refrigerator it was necessary to change from the stuffing box, which necessitates regular inspection and adjustment, to a device which is automatic in its operation, quiet, trouble-free, and dependable.

Much progress has been made in perfecting shaft seals for small refrigeration compressors, but the seal is still considered by many to be the weak point in the conventional refrigeration compressor.

The general design of all seals at present is based on a metal to metal joint between one stationary face and one rotating face. Due to the slight axial and transverse shaft movements, as well as slight errors of alignment present in all compressors to some extent, some degree of flexibility in one of the seal faces is necessary.

Various methods are employed to bring about this desired flexibility; the most common one being the use of a thin metal connection, either in the shape of a bellows or a diaphragm. While these methods are fairly satisfactory, one difficulty prevails; namely, that strength and ruggedness are sacrificed by using a metal which is thin enough and flexible enough to bring about the desired condition. This thin metal enclosure when subjected to torsional strains and continual vibration in time cracks, thus causing a leakage and necessitating a replacement.

Permits Flexibility

This inherent weakness has been eliminated to a certain extent by another type of seal, which is also of a radial type, incorporating all the advantages of other mechanical seals and at the same time affording flexibility in a remarkable degree without imposing in its movements stresses liable to cause fatigue deterioration of any parts.

The rotating member of this seal embodying one of the two seal faces is a cup shaped piece which is slipped on the shaft and connected to the shaft by a ring of composition material, very flexible and resilient.

The composition ring fits the shaft tightly enough to prevent any leakage along the shaft and also provides a connection between the shaft and the cup shaped seal ring flexible enough to compensate for any vibration or other shaft movement within reason. Due to the composition of this material the continual vibrations have no appreciable effect on it, nor does the oil combined with the various refrigerants attack it.

The seal spring under compression which is placed between the seal ring and a shoulder on the shaft is capable of sliding the seal ring together with the packing ring laterally on the shaft, thus taking up any end motion of the shaft as well as slight wear which occurs at the seal faces.

These few simple rugged parts complete the seal assembly which, due to the friction of the composition ring at the shaft and in the cup, rotates with the shaft. The mating seal face is securely placed in the gland cap which, in turn, is bolted to the compressor housing.

The materials used for the seal faces depend on the substance being handled and the operating conditions. Most generally a combination such as a hardened steel seal ring running against a self-lubricating bronze is satisfactory.

Depends on Operating Conditions

The spring pressure necessary to effect a tight joint is also dependent on the operating conditions. In all cases a comparatively light spring, strong enough only to counteract any possible pressure against the seal face, is used. This, as can readily be seen, reduces the friction at the metal to metal joint which, in turn, keeps the wear down to a minimum.

While a seal of this type is applicable only to compressors designed particularly for it, the manufacturers of this seal have realized the great need of a replacement unit which the service man can readily apply when the original seal fails, without any of the tedious work of relapping a shaft seal face, and so have put on the market a complete line of change-over units consisting of a Rotary seal assembly and a new end plate with gasket, which are now used extensively by service companies throughout the world.

A considerable saving in the time and labor involved in installation is made possible with change-over assemblies. The shoulder on the shaft is no longer used as a seal surface and so need not be refinished. Installation, which consists merely of placing the new seal parts on the shaft in proper order and bolting up the new end plate, can be done right on the job in a few minutes.

Replacement Methods

Rotary Seal replacement units are furnished complete and take the place of the entire original seal assembly.

After the original end plate and seal are removed from the compressor and the shaft wiped clean, the Rotary seal assembly should be assembled on the shaft allowing the end of the spring to thrust against the shaft shoulder.

The composition friction ring, which is fitted in the seal ring, fits snugly on the shaft and to make assembling easier, the inside diameter of this friction ring should be covered with a film of oil. Also, when putting the seal ring on the shaft a turning motion should be used. All sharp edges and threads on the shaft should be filed down so that the friction ring is not cut or chafed.

The seal ring should now be pressed toward the shoulder a few times, allowing the spring to move it forward each time.

After wiping both seal faces perfectly clean, apply a small amount of oil to each surface and bolt the new end plate on to the compressor, using the new gasket furnished. Care should be taken that this end plate is pulled up perfectly square.

Allow the seal th "run in" for 30 to 40 minutes before admitting the charge of refrigerant on it.

Unit No. 210: Installation of unit No. 210, which is applicable to the Norge compressor having a ⅝ inch shaft and a keyway running laterally in the shaft, is the same as above except that the small projection on the inside diameter of the friction ring is fitted into the slot in the shaft.

Be sure bronze ring used against shoulder on shaft as well as the bellows is removed before Rotary seal is installed.

Due to a variation present in the working lengths for the seals on Majestic and General Electric compressors, it is necessary to first measure the distance from the shaft shoulder to the machined surface on the compressor against which the end plate gasket is placed.

Unit No. 175: If distance measures ⅞ inch, use seal without any spacer between spring and shaft shoulder. If it measures 15/16 inch, use one of 1/16 inch spacer washers furnished.

Unit No. 190: If distance measures ⅞ inch, use seal without any spacer between spring and shaft shoulder. If it measures 15/16 inch, use one spacer washer. If it measures 1-1/16 inch, use three spacer washers.

Unit No. 310: When installing unit No. 310, which is the unit applicable to Servel compressors having a ¾ inch shaft and being originally equipped with a bellows seal, the original bearing plate remains on the compressor and is held on, together with the new end plate furnished, by the new, longer screws supplied. If the original stationary seal seat is held on to the bearing plate by four screws, this seat must be removed. If this seat is pressed into the plate it can remain untouched as it does not interfere with the Rotary seal assembly.

Dayton Makes 4 Types Of Replacement Belts

DAYTON — Dayton Rubber Mfg. Co.'s line of V-belts for replacement on refrigeration systems have been made available in four types—die-cut plain-V, die-cut cog-V, molded V-belts, and flat belts.

These belts, the manufacturer claims, are correctly designed belts for all makes of machines. A new leaflet covering the make and model of refrigerator, the refrigerator manufacturer's part number, and the Dayton belt number and size of belt, has recently been issued by the Dayton Rubber Mfg. Co.

Proper Methods of Installing Belts on New or Old Compressors

PHILADELPHIA — There are a number of precautions to be taken if V-belts, used as compressor drives, are to function properly, observes H. W. Weihenmayer, Jr., of the L. H. Gilmer Co.

A V-belt should never be forced on a drive, says Mr. Weihenmayer. The belt is designed purposely to resist stretching and the elongation caused by using a screw driver or other instrument to force the belt on is likely to strain or even break the pulling elements, which will impair or ruin the service of the belt.

Before installing a belt, states Mr. Weihenmayer, care should be taken that oil and grease are removed from the pulleys.

If an oil condition exists it should be corrected.

If the unit is old, the pulleys should be lined up to prevent noise and excessive wear on the part of the belt, advises Mr. Weihenmayer.

Mr. Weihenmayer says that belt dressing is not recommended.

It is not necessary to pull the belt exceedingly tight for effective operation, he says.

Skinner Designs Piston Ring with Inserts Of Babbit

NEW BRITAIN, Conn.—The new "Silver Seal" piston ring developed by the Skinner Chuck Co. has been designed with consideration for the abnormal wear on piston rings in refrigeration compressors due to the irregularity of lubrication, declares G. R. Dahlman, engineer for the company.

In construction, the ring consists of babbit inserts into and around the circumferential face of a high-grade cast iron piston ring. The number of bands as well as the amount of projection depends on the type of ring and installation. Each ring, regardless of size is processed individually, states Mr. Dahlman, to insure accuracy of the protruding anti-friction bearing metal.

When first installed, the babbit only contacts the cylinder wall, which being less in area, produces a higher unit pressure, thereby seating more quickly, burnishing the cylinder wall, and allowing the basic cast iron ring to come down to a gradual seat on the already burnished cylinder. It not only gives maximum compression to start, but maintains it throughout the life of the ring, claims Mr. Dahlman.

The combination of the babbitt alloy and cast iron against cast iron is said to reduce friction and wear on both the cylinder and rings.

There is nothing unusual about the installation of these rings as the standard tolerances for plain iron rings are used.

'Sabeco' Ring Construction Has Lubricant Factor

SAGINAW, Mich.—Metal used in the "Sabeco" seal rings for compressors manufactured by the Fredericksen Co. here is compounded from metals free from impurities and has the necessary high lead content uniformly distributed to supply the required metal lubricant.

These same qualities make the "Sabeco" metal satisfactory for bushings and bearings, declares Fredericksen engineers.

COMPRESSOR PARTS

Forced-Feed Lubrication Used In Ice-O-Matic Compressors

AN entirely new type of oiling system has been incorporated in Williams Ice-O-Matic commercial compressors, claim company officials. The former splash system is completely replaced by a force-feed system, and the oil supply has been removed from the crank case to an auxiliary oil tank or rectifier, affording a "dry" crankcase. An oil pump attached to the end of the crankcase opposite from the pulley is driven by the crankshaft. This pump is of a rotary, gear construction requiring no valves. It is sealed after assembly is completed.

The oil pump takes the oil out of the auxiliary oil tank and forces this oil under pressure through the drilled crankshaft to all main, connecting rod, and wrist pin bearings.

The continuation of the oil line in the crankshaft terminates in the seal cavity providing lubrication at all times to the seal. A flapper valve by-pass on the seal cavity automatically controls the oil pressure on the bearings under normal conditions between 15 and 25 lbs.

A recess machined into the inside of the piston skirt catches some of the oil which escapes from the wrist pin bearing.

This oil then feeds by gravity through a series of holes leading from this recess to an oil groove on the outside of the piston thereby furnishing positive lubrication to the cylinder walls.

The oil which escapes from the bearings, by-pass, etc., drops down to the bottom of the crankcase and flows by gravity into the auxiliary oil receiver or rectifier.

The high side methyl chloride vapors instead of being discharged direct to the condenser, are forced through a tube extending lengthwise through the oil receiver. Consequently, during ordinary operation the oil is kept warm by the superheat in the vapor.

A plugged opening is provided in the top of the oil rectifier. A gauge is attached to the bottom of this plug and a mark on this gauge indicates the proper oil level.

Total oil charge is four pints.

The advantage of this type of oiling system is not only lubrication improvement, under normal conditions, oil pumping complications are eliminated. In case some liquid methyl chloride is drawn back through the suction line into the crankcase, it causes no frothing because there is no oil supply in this part of the system.

In case such liquid refrigerant should get down into the oil receiver, the situation would not cause serious trouble because the oil is not agitated and in a very short time the heat from the discharged vapors will vaporize the refrigerant out of the oil.

Results of Tests on Different Materials Used for Refrigerator Gaskets

By A. R. Viel and R. O. Peterson, Research Laboratory, Victory Mfg. & Gasket Co.

THE man who uses refrigerator gasket materials may frequently be puzzled as to which one to select. What he is looking for is a material which is soft enough to fill in the irregularities on the flange faces without squeezing out; which is sufficiently strong to withstand the pressures employed in the refrigeration lines; of a density which will prevent slow leakage; and resistant to corrosive and solvent action of the coolant fluids.

If he can find such a material he has a refrigerator gasket which is essentially satisfactory. The characteristic of softness, he knows, may be found in fibrous materials, rubber compounds, cork, felt, etc. Experience has shown him that some of these materials lack density; others strength; and still others solvent or corrosion resistance.

Likewise many materials which are strong and dense, such as steel, lack softness and corrosion resisting properties. Many of the substances which do not corrode are either too expensive, too hard, too soft or softened by the solvent action of the coolant fluids.

Some high grade treated papers and the like seem to come very near to the ideal. They have, however, a few defects characteristic of their class. Among these is the tendency to yield to the solvent action of the refrigerant.

That class of materials which most nearly satisfies the above five requirements includes certain lead alloys. Almost all of this class are sufficiently strong, dense, and soft. None of them is appreciably swelled or softened by any solvent action but they are usually somewhat corroded. Those that are the most resistant to corrosion are the most desirable.

To assist the refrigerator man in selecting his better gasket, we have made a study of the materials of this class as to their resistance to corrosion.

From this group of alloys we have chosen the following as having characteristics best representative of the class:

(1) Commercially pure lead
(2) Tellurium-lead alloy
(3) Tin-lead alloy
(4) Antimony-lead alloy
(5) Tin-lead-antimony alloy
(6) R. M. No. 150
(7) R. M. No. 160

The latter two are alloys of tin, antimony, copper, and lead.

Of the various refrigerants commonly used, we found by test that liquid ammonia was, by far, the most corrosive to the metals in question.

In this work, the various materials were all cut to exactly the same sizes and separately tested with liquid ammonia for a continuous period of one month. From time to time they were inspected and the changes calculated and recorded.

The conclusions which we draw from our results are: that ordinary lead is moderately corroded; that the addition of a small part of tin to this improves its properties; that the admixture of antimony with lead still further improves the material; and that, as would be expected, the addition of both tin and antimony to lead is better than either alone. Addition of copper to the above three-metal alloy brings about a still further improvement and makes the resulting alloy approach the ideal.

R. M. No. 150 is our own standard production and is used as original equipment by the majority of refrigerator manufacturers. R. M. No. 160 is favored by a few others.

Tellurium alloy, which is much acclaimed for other purposes, was found to be inferior even to ordinary lead and cannot be recommended for use in ammonia systems for this reason.

Many Units Damaged In Installation by Wrong Procedure

By A. D. Greene, Hardy Mfg. Co., Inc., Dayton, Ohio

EXPERIENCE has determined that many commercial condensing units are unintentionally injured at the time of installation by using the same procedure in placing a dry-expansion system in operation as that of a flooded system.

The flooded and dry-expansion systems employ entirely different methods of liquid refrigerant control. The flooded system employs a float valve which maintains a constant liquid level at all times regardless of coil temperature, whereas in the case of a dry-expansion system the liquid refrigerant is controlled by an expansion valve which operates mainly from the temperature of the cooling coil. Therefore, it is obvious that different methods must be used in starting a new installation on the different type systems.

The injury sustained by the condensing unit occurs when a large quantity of liquid refrigerant is allowed to enter the crankcase. On a flooded system liquid refrigerant can only enter the crankcase, of the condensing unit through a defective float valve. Therefore, if the float valve is mechanically right no special attention need be given a flooded type system on the start.

On a dry-expansion system the crankcase of the condensing unit can be flooded before one is aware of it, by completely opening the liquid line valve on the condensing unit with the cooling coils warm, no pressure in them, and the compressor not running.

Therefore, on starting a new dry-expansion installation the liquid line valve on the compressor should be throttled manually until the cooling coil has been lowered in temperature sufficiently to place the power element of the expansion valve in operation, thus automatically controlling the flow of liquid refrigerant to the coil.

The results of flooding a crankcase are that the liquid refrigerant being heavier than oil naturally raises the oil level to a point where it is pumped by the pistons. Also, when the pressure is relieved in the crankcase violent boiling takes place, which of course causes the oil to foam, adding to the amount of oil that is scrubbed or pumped from the crankcase.

The scrubbing or pumping of oil by the compressor really acts as a hydraulic ram throwing a tremendous strain on the moving parts and it is possible to cause distorted discharge valves, bent or broken connecting rods, and aside from the mechanical damage, the oil in the crankcase has been lowered to a dangerous point, which in all, puts a perfectly good compressor off to a bad start.

Rubber of Various Qualities Used In Refrigerator Manufacture

By J. F. Johnston, The Miller Rubber Co., Akron, Ohio

AS the science of manufacturing electrical refrigerators has progressed during the last decade, the use of rubber in their construction has increased, and the amount of study and research given to that factor has correspondingly been lengthened.

Rubber is used for a wide variety of purposes in the electric refrigerator and to be successful and virtually trouble-free must possess, in most cases, the following factors:

1. Non-staining
2. Odorless
3. Long aging, to give long life
4. Must have reasonably good resistance to animal fats and vegetable oils, such as butter, cooking oils, salad dressings.
5. Must be light weight, and yet not sacrifice strength for lightness.

Chief uses of rubber in connection with compressors and condensers, and their parts are as follows:

(a) As mountings, or supports to the unit, to act as vibration absorbers or dampeners.
(b) As liquid line covers.
(c) As washers, grommets, and special molded parts.

In the first classification, the rubber has several purposes, to assist in making the unit's operation as noiseless as possible, to lengthen its life, and to prevent maintenance repairs that might be caused by vibration.

Rubber for this purpose must be lightweight, have excellent cushioning ability. In some applications, where the mountings are subject to the action of oil, *Prenite* is used because of its oil resisting qualities.

Rubber used in the second classification is of the sponge type, cellular in construction, very flexible to follow the irregular contour of the pipes. Its purpose is primarily that of insulation, to prevent dissipation of the cold possessed by the refrigerant. This rubber, too, must be lightweight, particularly for ease in handling during construction of the refrigerator.

Besides these applications of rubber with compressors and condensers there is a wide range of other uses in refrigerators, most of which bear directly on the unit.

Those which do have a direct bearing on the unit do so because they are used primarily for insulation purposes, to prevent the cold from escaping after it has been created, or the heat entering from the outside, thus increasing the load on the compressor and condenser.

In this group of applications are door gaskets, which make possible a perfect seal when the door is closed; panel seals, which serve the same purpose by allowing panels of irregular construction to be joined, and insulation breakers, which serve as obstructions to heat conductivity.

Altogether there are from 15 to 25 different applications of rubber in the modern electric refrigerator, and these lend themselves to nearly 1,000 adaptations when all types are considered, each particular make and model presenting an entirely different set of sizes and designs.

As in other sections of the electric manufacturing field, knowledge and technique, gained through years of experience go a long way toward solving each individual problem. The Miller Rubber Co. was called in when the industry was virtually in its infancy to assist in the solution of many problems where rubber plays a part.

All rubber parts have to be held to unusually fine tolerances, for example, and this calls for extreme care in compounding, vulcanizing, and inspection.

The constant battle to reduce weight of refrigerators has imposed on the manufacturer of rubber parts added day-to-day problems which are being solved in the laboratory and factory.

ONE PICTURE IS WORTH A THOUSAND WORDS, according to the old proverb. There is a picture of real importance to everyone in the refrigeration and air-conditioning industries. It cannot be painted, drawn, or photographed. Yet its worth right now cannot be overestimated. It is the cross-section of industry conditions in the spring of 1936. Forward-looking executives are trying to visualize that picture now.

Estimates of the various factors which make up this picture must affect every decision concerned with production and merchandising plans for the coming year. And every major decision will in turn set the tone of the picture in its relation to individual products and companies.

The broad outlines will probably be marked by certain important elements which are already evident: (1) improvement in general business conditions, based on the return of confidence in the fundamental economic stability of the United States; (2) increasing emphasis on modernization of buildings and homes everywhere; (3) and the continued growth of air conditioning and its interwoven relationship to the refrigeration industry.

The shading and details of the picture, the place of each company and each product, will depend upon the activity of the industry during the coming months. The type of products you develop, the choice of materials, the correctness of your designs, the vitality of your sales and promotion program—these will determine your share of the 1936 industry picture. One activity demanding immediate attention is your plan for trade education through advertising in Electric Refrigeration News.

The picture can only be outlined as yet; the details will be formed with the passing of the season. Wisely directed promotion at this time can develop a broader market for your products throughout the coming year. If you have sufficient confidence in your product to advertise it consistently in the News, the industry will reward your faith and foresight.

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Home on the Range

ELECTRIC range sales may turn out to be the big surprise of 1935 in specialty selling and home appliance circles. From authoritative sources the prediction is now being heard that at least a quarter of a million electric ranges will have been sold before the whistles blow for a New Year. To those who are familiar with the relatively small sales totals normally registered by the electric range industry, this estimate for 1935 is like money from home—as welcome as it is unexpected.

Ranges haven't been ballyhooed especially this year, nor have they received the attention bestowed upon refrigerators, laundry equipment, and air conditioning by dealers. All of which might indicate that the long-awaited public acceptance of electric cooking seems to be started on the road toward realization. If that's the case, concerted promotional effort in 1936, together with more attention on the part of dealers, should make possible an all-time sales record for the electric range industry.

Handicaps to Acceptance

Electric cooking has been handicapped by: (1) early range models which were slow to heat, and extravagant to operate; (2) high rates for electricity; (3) installation costs which seemed to be exorbitant; (4) a dearth of information on the proper use of electric ranges; and (5) an exceedingly able competitor with high public acceptance—gas cooking.

But one by one, these handicaps have been removed. Present-day ranges heat quickly and efficiently. Good engineering has reduced their operating costs, as have special range rates (offered by some public utilities) and lowered costs for kilowatt hour consumption generally. In many cases the utilities are absorbing range installation costs.

Home Economists Have Helped

Furthermore, home economists have developed a wealth of practical information on electric cooking—information which is in itself an exceptionally convincing sales story. Apparently the range industry is all set to profit from a strong promotional campaign.

As to competition from the gas range, that's still the "catch" in the business of promoting electric cooking. In the case of practically every other home appliance, the electrical product represents something so distinctly superior to the older methods of doing things that the whole question of selling the appliance revolves around the matter of justifying the expenditure.

Gas Range Tough Competition

The gas range, however, is quick, efficient, and economical. It has high public acceptance. And it has, moreover, strong backing from the "combination" utilities (those which sell both gas and electricity)—"backing" which frequently makes it tough for the electric range. Thus it provides unusually hard-to-buck competition.

Nevertheless, the news that 250,000 or more electric ranges will be sold this year is genuine news, and probably it marks the coming of age of a business which for many, many years has been running around in short pants.

The promotional activities of the Federal Housing Administration, with which so many big league manufacturers are now tying in, will all aid electric range sales in 1936. A large share of the "modern homes," which are now being erected to show the public what strides have been made in making the business of living more convenient and comfortable, will have electric ranges as standard equipment.

Promotion Inadequate Thus Far

Lower financing rates will help, as will cooperation in the matters of special rates and absorbed installation costs on the part of those public utilities which are not tied up with gas, and which are trying desperately to build up their domestic load as a protection against the battering down of rates.

Few range manufacturers thus far have shown any willingness to prove their faith in their products by engaging in promotion campaigns remotely adequate to the task of building sufficient consumer acceptance to insure high-volume sales. But there are now to be seen a few straws-in-the-wind which indicate that more than one maker of electric cookery equipment will this year get down to brass tacks about this long-neglected phase of the industry's development.

Learn to Cook, Mr. Salesman!

Electrical appliance salesmen may find that 1936 will be a "range year." And, in consequence, if they are prepared, if they have learned well the fascinating story of electric cooking, they stand to make some money for themselves and their employers.

So far, the most successful range salesmen have been those who have studied the art of preparing food on an electric range, and who can talk about it intelligently to housewives. With so many factors pointing toward the stimulation of a genuine demand for this rather backward member of the electrical appliance family, it will well behoove the ambitious salesmen—as well as distributor and dealer—to study the range, and what it will do, so thoroughly that he will be truly at "home on the range."

WHAT OTHERS SAY

Giving Buyers More Facts

INCREASED sales and earnings of the leading corporations offer the most convincing proof that one could demand that buyers are again in the market. Wants that have been denied during depression years are again being supplied. Money is being spent not only for the things required for a subsistence level of existence, the apparent objective of many who regard themselves as socially in advance of the crowd, but for the products which add to the comforts, conveniences and pleasures of living.

All of this should and no doubt will have a very definite effect on advertising, both as to character and volume. One immediate result should be the employment of a more informative style of copy, which will tell the interested buyer the things he wants to know about the goods he is planning to purchase. Copy packed with specific data, and piling up fact on fact that demonstrates the utility and value of the product advertised, will be read today with far greater interest than ever before, for the obvious reason that more readers of advertising are now in a buying mood.

During the tough times which marked the bottom of the depression, advertising had a difficult task to perform. It had to jolt consumers into a more than passive attitude toward purchases. Scare copy was frequently the only answer. Harshly competitive advertising was another sign of the times, with manufacturers going after the reduced dollars of buyers with copy which was brutally frank in its attempts to expose the weak points of other products in the same field.

While this kind of copy could be condoned, if not defended, because of the stress of circumstances under which it was written, there is little excuse for it at present. Positive, constructive, informative advertising is indicated now, with markets expanding, an increased number of buyers presenting themselves at retail counters, and an increased volume of dollars burning holes in the pockets of hungry consumers.

Under these conditions, why not forget the ballyhoo, the knock-'em-down-drag-'em-out style of competitive advertising, and return to simple, informative copy which recognizes that the buyer needs facts on which to base an intelligent decision regarding the purchase of something which he needs and wants, and which he intends to buy from somebody, somewhere, in the immediate future?

Promotion of sales is, after all, promotion of sound buying, and advertising serves its most useful and acceptable purpose in accelerating buying by the simple process of making buyers better informed regarding the products for which they may be in the market.—*Advertising Age.*

LETTERS

Supply Jobbers Accept Invitation of Committee To Meet in Detroit

The Harry Alter Co.
Refrigeration Manufacturers and Jobbers—Parts and Accessories for Commercial & Domestic Refrigeration
1728 S. Michigan Ave., Chicago, Ill.

J. D. Colyer, Chairman of Committee.

We wish to thank you for your invitation to attend a dinner meeting of refrigeration supply jobbers on Oct. 23 in Detroit. We want to take this opportunity of expressing our appreciation to the refrigerator manufacturers who are making this meeting possible, and to assure you of our whole hearted cooperation, and support.

There is a distinct need in the refrigeration industry for an organization of refrigerator jobbers. Such an organization would not only be of benefit to the refrigerator supply jobbers themselves, but by improving distribution and merchandising the organization would be of merit to the manufacturers, and would facilitate the development of better service and dealer organizations.

Assuring you that the writer will be present to represent our organization, and again thanking you for your kind invitation.

IRVING ALTER.

Burstein-Applebee Co.
Wholesale Distributors
Parts & Supplies
For the Service Man.
Short Wave & Television
1012-14 McGee St., Kansas City, Mo.

Publisher:

We acknowledge and thank you for your letter of Sept. 25 and we accept with pleasure the invitation to attend the dinner meeting of Refrigeration Supply Jobbers at the Hotel Wardell, Detroit, on the evening of Oct. 23.

It is our belief that much good can come from a meeting such as you have arranged and we hope that all interested manufacturers and distributors will cooperate with each other in arranging a program for the future that will protect the industry from a profit viewpoint.

M. W. APPLEBEE.

William M. Orr Co.
Refrigeration and Air Conditioning Supplies
1228-30 Brighton Rd., Pittsburgh, Pa.

Publisher:

In reply to your letter of Sept. 25, relative to supply jobbers' meeting in Detroit, Oct. 23, we wish to thank you for the invitation to this meeting.

The writer intends to be there. We are quite enthused over the interest shown by the Detroit manufacturers. We think a meeting of this type will certainly be effective both from the standpoint of the manufacturers and of the supply jobbers.

H. A. DAUM.

The Spangler Co., Inc.
Wholesale Refrigeration Supplies
3331 Market St., St. Louis, Mo.

Publisher:

This will acknowledge receipt of your letter and invitation of Sept. 25, announcing the dinner meeting of refrigeration supply jobbers to be held by your organization Oct. 23.

The writer intends to spend all of that week in Detroit, and you may count upon my presence.

R. H. SPANGLER.

William & Co., Inc.
Refrigeration Division
2118 Spring Grove Ave.
Cincinnati, Ohio

Attn. Mr. J. D. Colyer:

This will acknowledge and thank you for your kind invitation to attend the meeting in Detroit at the Hotel Wardell at 6 p. m. Wednesday evening, Oct. 23, 1935.

We will not have a representative from this office, but no doubt Mr. H. S. McCloud, in charge of our Refrigeration Department, located in Pittsburgh, will get in touch with you, as he probably will attend this meeting.

W. P. DETTWILER,
District Manager.

F. H. Langsenkamp Co.
Jobbers of Refrigerator Fittings
229-237 E. South St., Indianapolis, Ind.

Publisher:

In reply to your letter of Sept. 25, we wish to advise you that our Mr. J. A. Cassady will attend the Refrigeration Supply Jobbers' dinner, Oct. 23 as a representative from our company.

We thank you very kindly for bringing this meeting to our attention.

F. LANGSENKAMP, JR.,
Treasurer.

J. M. Oberc, Inc.
Wholesale Refrigeration Supplies
1203 Stanley Ave., Detroit, Mich.

Publisher:

Replying to your letter of the 25th, regarding meeting of jobbers in Detroit, Oct. 23, please be advised that the writer, as well as Mr. E. H. Davey will be glad to attend.

J. M. OBERC.

Manufacturers Invited

Airo Supply Co.
Parts, Tools and Supplies for Air Conditioning and Electric Refrigeration—Wholesale Only
407-10 N. Wells St., Chicago, Ill.

Publisher:

In reply to your letter of Sept. 25, in regards to the meeting in Detroit of the refrigeration supply jobbers and manufacturers, we are pleased to inform you that you may count on two members of our organization being present.

C. E. HAMILTON,
Purchasing Agent.

Kerotest Manufacturing Co.
Valves and Fittings
2525 Liberty Ave., Pittsburgh, Pa.

Publisher:

I shall be glad to accept your invitation to join your party on Wednesday evening, Oct. 23, at which time other manufacturers of refrigeration accessories will meet with a goodly representative group of jobbers of refrigeration supplies, and lend what assistance I can toward ascertaining what type of concerns are entitled to recognition in the term of jobbers discounts, and in setting up standards or guide posts for this relatively new branch of the industry.

J. S. FORBES,
Treasurer.

Going Into Business

Helen, Ga.

Editor:

Enclosed herewith please find one five dollar bill for which please send me the two volumes of the 1935 REFRIGERATION DIRECTORY and MARKET DATA BOOK.

About the first of the year I anticipate starting operations in St. Petersburg, Fla., which has been my home since 1922, as a manufacturer's representative, distributor or dealer, and as an engineering, service, and installation agency covering the state of Florida and the southern part of Georgia.

If you have any suggestions as to better methods to secure information as to prospective manufacturers to contact other than to write to all manufacturers as listed in your DIRECTORY I will appreciate receiving the same. I am also desirous of having data on manufacturers of industrial refrigerating equipment and accessories and trust that the same will be listed in the 1935 DIRECTORY.

I am a regular subscriber to the ELECTRIC REFRIGERATION NEWS and have purchased your DIRECTORY ever since it originated and will appreciate information as to when the 1936 DIRECTORY will be out and when forms for advertising in the same will close.

E. L. GEDNEY, JR.

Service Men Interested

H. J. Schroeder Co.
Refrigerant Gases
Copper Tubing—Refrigeration Valves Fittings
1202 S. Calhoun St., Fort Wayne, Ind.

Editor:

Referring to your letter of Sept. 11, 1935, we are very much impressed and enthused with your proposition regarding the sale of the ELECTRIC REFRIGERATION NEWS and other publications at our counter. We have service men and service companies from all northern Indiana and southern Michigan who buy refrigeration supplies from us who we feel sure will be interested in buying these issues.

H. J. SCHROEDER CO.

News Well Received

General Refrigeration Supply Co.
25 North Tenth St.
Allentown, Pa.

Publisher:

Please pardon our delay in answering your letter of Sept. 10 covering sample copies of ELECTRIC REFRIGERATION NEWS received for distribution to the service men and dealers.

We are glad to advise your copies of the NEWS were well received. In view of the fact that quite a number of service men had not received a copy of the first samples, we distributed the second batch at no charge.

We suggest you forward a dozen or so order blanks and we will endeavor to get as many subscriptions to the REFRIGERATION NEWS as possible.

O. A. LAISON,
General Refrigeration Supply Co.

Likes Patterson Story

Electrical League of the Niagara Frontier
512 Stock Exchange Bldg., Buffalo

Editor:

I have enjoyed the article by Mr. J. H. Patterson of the National Cash Register Co. very much, and am wondering whether you intend making up reprints and placing them all together under one cover in the form of a pamphlet. If you are I would like to be one of those to receive a copy.

SAMUEL S. VINEBERG,
Manager-Secretary.

CONDENSERS

Determination of Condenser Sizes For Household Units

By R. E. Tobey, Refrigeration Engineering Department, Westinghouse Electric & Mfg. Co., East Springfield, Mass.

IN the design of small air-cooled condensers for refrigerating units, accurate calculation of condenser performance is very difficult, due to the variables involved. In selecting a condenser for a given service, actual determination of the capacity of the units with that condenser is desirable. If several types or sizes of condenser are under consideration, considerable time and labor are required to determine which condenser is most efficient for the application if each condenser must be assembled and tested on the unit. Slight variations in test conditions may obscure the effect on unit performance of the various condensers.

Apparatus for Testing

The method of testing condensers which will be described was worked out to give a rapid method of comparing performance of different condensers. This apparatus permits the determination of the performance of a condenser in a single day and results obtained with it have been found to be very accurate in predicting the actual performance of the condenser on a unit.

Figure 1 shows a diagram of the apparatus used for these tests. A small steel tank for the refrigerant

Apparatus Used

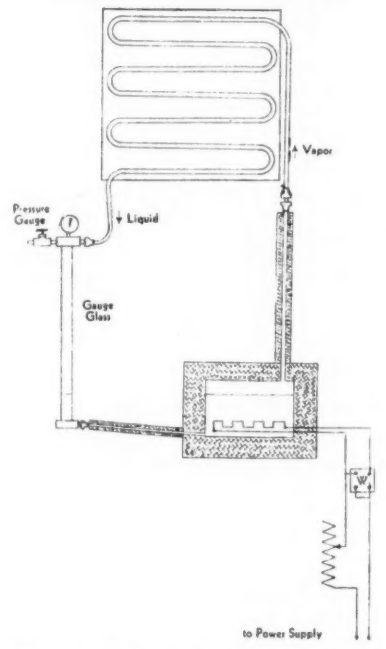

Fig. 1—Diagram of apparatus used in condenser tests.

is inclosed in a larger shell and the space around the tank is filled with heat insulating material.

An electric heating element is sealed inside the tank with the input to the heater controlled by an external variable resistor.

Copper tubes for inlet and outlet are brought out from the tank, and a gauge glass and a pressure gauge are connected between the condenser being tested and the inlet to the tank. The other side of the condenser is conncted directly to the outlet tube from the tank.

A watt meter is connected in the power circuit between the heater and the variable resistor to indicate the input to the heater.

Method of Testing

To test a condenser, the system is charged with refrigerant until the tank is approximately two-thirds full. The level of the liquid refrigerant in the tank is indicated by the level in the gauge glass.

After the system is charged, the heater is connected to the power supply and the variable resistor is adjusted for a definite wattage as read on the meter. The heat evaporates refrigerant from the tank and builds up pressure. The refrigerant vapor rises to the condenser where it is condensed and returns through the gauge glass to the tank.

The liquid level in the gauge glass rises above that in the tank until the pressure of the column of liquid is equal to the pressure drop through the condenser. Watts are held constant until the pressure as read on the pressure gauge becomes constant. Readings are then taken of watts, pressure, and ambient temperature.

From the stabilized reading of pressure the corresponding refrigerant temperature may be obtained from the pressure-temperature curve of the refrigerant used. The temperature difference between the refrigerant and the surrounding air may then be determined, and with the reading of watts changed to the equivalent B.t.u. per hour, the B.t.u. per hour per degree F. may be determined.

Curve of B.t.u. Per Hour

By taking a series of readings by varying the watts input a curve of B.t.u. per hour per degree F. against temperature difference may be obtained.

Before completing these calculations it is necessary to correct the B.t.u. per hour for the heat dissipated from the rest of the system outside of the condenser. To obtain this correction the condenser is omitted from the circuit and the outlet tube from the tank is connected directly to the top of the gauge glass.

A series of readings taken as before gives data for a curve of B.t.u. per hour against temperature difference for this circuit. Then for any temperature difference at which a reading is taken on the condenser, the correction may be read from the curve and deducted from the original value obtained.

Disconnecting Condensers

When several condensers are to be tested in succession, if shut-off valves are provided at the two points where the condenser is connected to the system, condensers may be disconnected or replaced without purging the refrigerant from the system.

At the conclusion of a test the refrigerant may be driven back into the tank by heating the condenser. After the two shut-off valves are closed, the condenser can be removed and a new one connected in, the air in the second condenser being purged by opening one valve and passing refrigerant vapor through the condenser for a few seconds before tightening the nut at the opposite end of the condenser.

Results of Tests

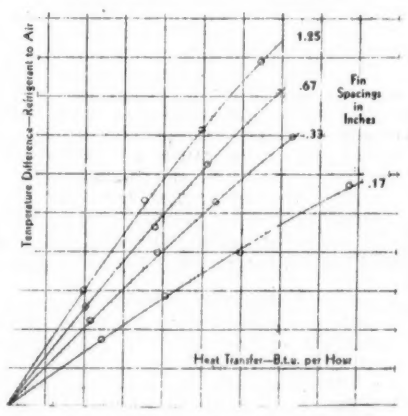

Fig. 2—Heat transfer curves for different fin spacings.

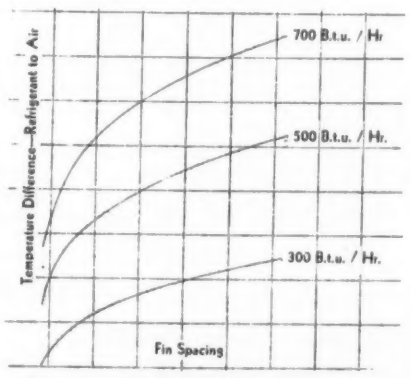

Fig. 3—Effect of fin spacing on condenser capacity.

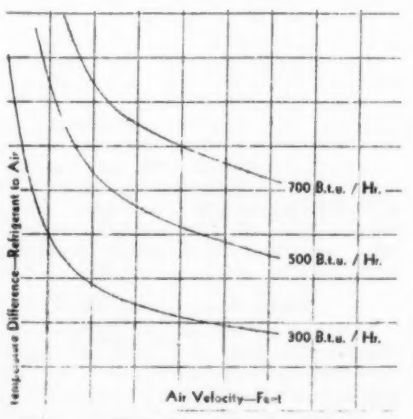

Fig. 4—Relation of air velocity to condenser capacity.

Data on Fins and Tubes

This test apparatus may be used with very good results to determine the dimensions and number of fins and tubes of a condenser for a domestic refrigerating unit and also to determine the air velocity to be used.

Several condensers were built up, each one differing from the others either in number of tubes, number of fins, or size of fins. Curves were then taken on each condenser in the manner previously described with several different air velocities.

Figure 2 shows curves taken on four condensers alike in every respect except fin spacing. These curves are typical of the curves taken with this apparatus. Four points were taken on each condenser by varying the input to the heater.

The curves of temperature difference against fin spacing shown in figure 3 for different values of heat transfer were drawn by taking points from the curves of figure 2 for three different values of B.t.u. per hour.

Temperature Difference

Figure 4 shows curves of temperature difference against air velocity which were obtained from a set of curves similar to those in figure 2 with each curve taken with a different air velocity.

The length and height of the condenser to be used were already fixed and these dimensions determined the length of tubes and length of fins for the condenser. The possible variables then became number of tubes, number of fins or fin spacing, and fin width.

Nine condensers were built up with 5, 7, and 9 tubes and ⅞, 1¼, and 1⅝ inches width of fins. These were first tested with minimum fin spacing of six fins per inch at different air velocities. The spacing was then increased by removing alternate fins and the tests repeated.

By reducing the number of fins after each set of tests, curves were obtained as in figure 2 which shows curves for four different spacings at the same air velocity for one fin and tube combination. At the conclusion of the complete set of tests, data were available for curves showing the effect of any of the previously mentioned variables on the performance of the condenser.

Discharge Pressures

Actual operating discharge pressures for a given condenser and a given B.t.u. per hour load cannot be determined from data taken in this way because of the errors introduced by the superheated discharge vapor from the compressor and the refrigeration losses through the system.

By assuming the additional B.t.u. per hour from these sources, an approximate value of discharge pressure could be determined. However, the chief value of this method of testing condensers is to obtain a direct comparison of different condensers under identical conditions, and for this purpose the method described here will give accurate results with a minimum of time and labor.

Dirty Refrigerator Condensers Cut Down Efficiency; How to Clean Them

By Joe Askin, Chief Engineer, Fedders Mfg. Co.

AN important service operation of household as well as commercial machines is to clean the exterior of the condenser.

Invariably a small amount of oil from the motor collects on the condenser fins. Dust particles from the air adhere to the fins, and, after a while, the accumulation of dust becomes quite thick as a result of associating with the oil.

This results in reduction of heat transfer due to restriction of the flow of air and due to the insulating effect of the dust.

For example, a decrease of air volume from 500 c.f.m. to 400 c.f.m. results in a decrease in condenser capacity of 13 per cent. In addition

Dirty Condenser

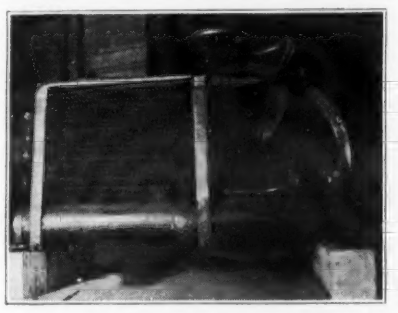

Fig. 1—Condenser which has not been cleaned for a year.

the insulating effect of the "fluffy" dust on the surface of the fins may result in a decrease in capacity of 20 per cent. (In some cases the decrease in capacity may be as high as 90 per cent!)

An increase in head pressure of 20 lbs., due to the condenser being dirty, resulted in the capacity of a certain high side decreasing from 2,395 B.t.u. per hour to 2,015 B.t.u. per hour, or to 84 per cent of its capacity.

Method of Cleaning

Fig. 2—Cleaning condenser with automobile tire pump.

Such results as this may be very serious, with resulting longer operating time and increase in current consumption.

A condenser which hadn't been cleaned for a year is shown in Fig. 1.

A simple method of cleaning a condenser is to blow the dust through with an ordinary auto pump. This is much more preferable than a brush as it gets the dust out from *inside* of the condenser instead of forcing the dust *into* the inside portion of the condenser.

Also, it must be kept in mind that if the condenser happens to be a two pass, three pass, or greater, it cannot be cleaned with a brush at all and must be cleaned with a pump if a thorough job is desired.

Fig. 2 shows the same condenser as in Fig. 1 with a portion of it cleaned out. The auto pump is easily available to anyone and cleaning may be done right on the job without moving the condensing unit.

Use the pump with a quick downward motion, holding the end of the hose against the face of the condenser.

Fig. 3 shows the condenser when the cleaning job was completed.

Finished Job

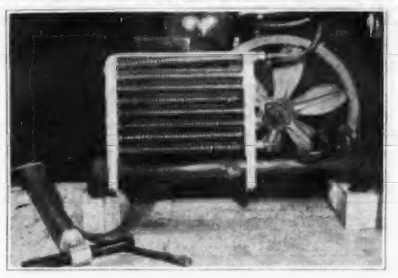

Fig. 3—Condenser which has been cleaned with air pump.

Copper Tubing Must Be Free from Dirt, Moisture

ERIE, Pa.—Many failures of refrigeration systems have been traced to tubing in which moisture or particles of grit or dirt has been discovered, declares K. W. Wilks, vice president of Penn Brass & Copper Co.

The grit or dirt may be an oxide of the tube itself which might be overlooked when inspected by the naked eye, but when analyzed the oxide will be found to be such as to not dissolve readily. This will cause a needle valve to clog, or moving parts to become scratched.

Copper tubing, says Mr. Wilks, should be carefully drawn by experienced men, inspected carefully for any defects, with the final operation of annealing carried out through the non-oxidizing furnace under a clean gas pressure with all moisture excluded.

Dehydrated tubing should be sealed so securely and effectively that all moisture is entirely eliminated. Where the tubing is to be tin plated or hot dipped, says Mr. Wilks, all possibility of air, water or plating compound getting into the tubing should be eliminated.

REFRIGERANTS & OILS

How to Transfer Methyl Chloride To Small Cylinders

By E. W. McGovern, R. & H. Chemicals Dept.,
E. I. du Pont de Nemours & Co., Inc.

THE transfer of methyl chloride to smaller cylinders can be accomplished quickly and efficiently, with very little loss of refrigerant, using a simple procedure and inexpensive equipment. For these reasons, service organizations and supply houses, excepting those whose refrigerant needs are very small, generally find it advisable to take advantage of the lower prices applying on larger cylinders of refrigerant and do their own transferring to the smaller service cylinders.

Various transfer methods can be used, depending on the equipment available, but it is not necessary or advisable for the average organization to install elaborate apparatus. The methods outlined below can also be used for other refrigerant gases.

Purge Method

Fig. 1 illustrates the set-up recommended by the National Ammonia Co., Inc., distributor of methyl chloride which is best suited to the needs of the average service man or service organization. This method features a three-way purge valve (or its equivalent—a valve on a "tee") which eliminates connections and disconnections during the transfer, thus saving time and reducing loss of methyl chloride.

In a test, 28 3-lb. cylinders were filled from a larger cylinder with a total loss of less than 1 lb. (1.2 per cent) of methyl chloride. Fittings required can be obtained at a cost of less than $3 for the least expensive, and $8 or $10 for the higher quality.

Equipment Required

Heavy wooden rack (E) to hold large methyl chloride cylinder, as shown in Fig. 1. Pieces holding cylinder are cut out to fit around neck and bottom.

Rack should hold the cylinder at an angle of 30° or less from vertical to insure complete drainage.

Purge Method of Transfering Methyl Chloride

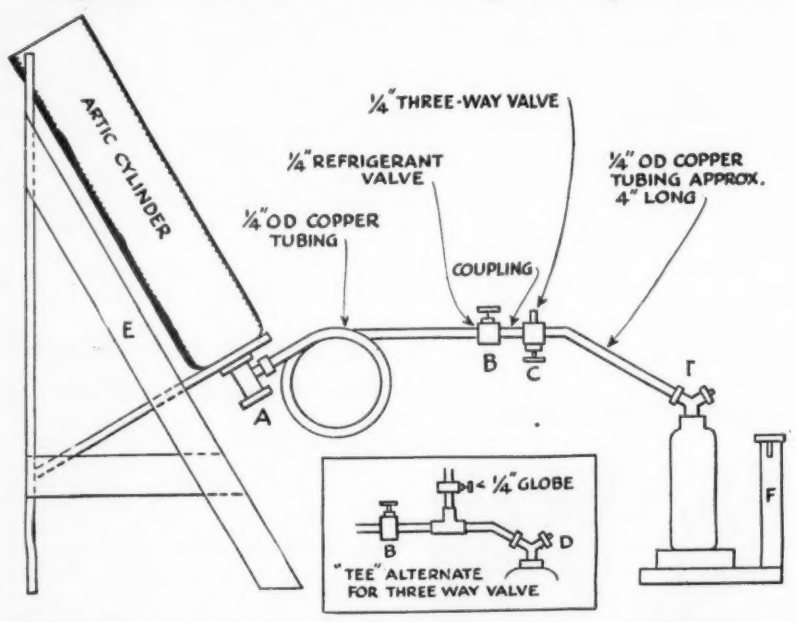

Fig. 1—Set-up for purge method of transferring methyl chloride. Insert at bottom shows how a "T" equipped with a ¼-inch globe valve may be substituted for valve C.

Detail of Union

Fig. 2—Union for connecting copper tube to cylinder valve.

Also, the stock cylinder discharge valve (A) should be as high above the receiving cylinder valve (D) as is possible and convenient—at least, it should be 2 or 3 ft. above floor level.

Flexible copper tube of approximately ¼ in. O.D. from large cylinder valve (A) to stop valve (B). This tube may be of any convenient length, usually 4 to 6 ft., and should have a loop of 8 in. to 12 in. diameter near the large cylinder end.

A union is required to attach the tube to the large cylinder valve (A). This union may consist of a flare nut on the flared tubing and an adapter on the valve to fit the flare nut, as shown in Fig. 2. Similar connections can be used at other joints which are not brazed or soldered.

Stop valve (B) should preferably be a good quality refrigeration type valve. These can be obtained so as to attach directly to flare copper tubing with a flare nut.

A ¼ in. globe valve can be used, but it may defeat its own purpose by allowing the escape, between transfers, of refrigerant contained in the copper tube.

Purge valve (C) is a three-way valve of a size to fit the copper tubing. It may be connected to valve (B) by a coupling. A "tee" equipped with a ¼ in. globe valve may be substituted for valve (C).

A ¼ in. copper tube, about 4 in. long, equipped with a flare nut at the end connecting to valve (C) and a union at the end connecting with receiving valve (D).

Platform scales, (F). If the small cylinder has a round bottom it should rest in a hollowed-out block, as shown.

Procedure Where Cylinder Contains Air

1. Weigh small cylinder with tubing connected as shown.
2. See that all four valves are closed.
3. Open large cylinder valve (A) and stop valve (B).
4. Crack purge valve (C) until liquid appears at vent, then close.
5. Open valve D on the small cylinder until approximately ¼ lb. of refrigerant is transferred, then close stop valve (B).
6. Open purge valve (C) to blow out any air in small cylinder. It is not necessary to bleed off complete contents of cylinder—15 to 30 seconds purging is usually ample, and a little experience quickly enables one to avoid waste of gas. This also cools the small cylinder producing a pressure differential which aids the flow from the large cylinder.
7. After closing purge valve (C), again open stop valve (B) until the scale shows that the desired amount of refrigerant has entered the small cylinder.

Caution—Avoid overfilling, otherwise a rise in temperature may cause the liquid to expand, filling the cylinder and rupturing it.

8. Close stop valve (B) and small cylinder valve (D). Empty the line between these valves by opening purge valve (C) to avoid rupture of the line by expansion of liquid. Likewise, if it is necessary to close valve (A), that is, over a long shutdown period, the tube between it and stop valve (B) should be emptied through purge valve (C). Generally valve (A) should be left open and the line from it left full of liquid.
9. Break union at small cylinder valve (D) and remove small cylinder.

Note: This method can also be used when the cylinder is free from air and contains a small amount of pure refrigerant, but in this case purging serves merely to cool the small cylinder and thus promote the transfer. The purging loss involved, though small, may be avoided by the external cooling method.

External Cooling Method

For Cylinders Free from Air and Containing a Small Amount of Refrigerant

As the small cylinder already contains refrigerant, it is not necessary to purge to remove air. However, since gravity flow can hardly be depended upon for the transfer, it is necessary to have stock cylinder (A) at a higher temperature, and therefore higher pressure, than receiving cylinder (D).

A temperature difference of 10° F. between these cylinders produces a differential pressure of about 7 lbs., which is equivalent to elevating the stock cylinder 16 ft. above receiver.

To produce this temperature difference, service men sometimes resort to heating the stock cylinder with a torch. As a general rule, this is bad practice, as the cylinder may be overheated so that it must be retested before being used again.

If the test shows the steel to have been damaged structurally, it is sometimes, but not always, possible to reclaim the cylinder by reannealing.

Incautious heating may also cause the melting of a fusible plug, as these melt at 158° F. Heating with low pressure steam is preferable to a torch, but care must be taken not to overheat around the fusible plug.

It is preferable that the temperature difference be produced by *cooling the small cylinder* in a bucket of cold water, ice water, or cool medium.

Equipment Required

The same as shown in Fig. 1 and described above under "Purge Method." A vessel, usually a bucket, to hold the receiving cylinder and cooling medium, also is required.

Procedure Where Cylinder Contains A Little Refrigerant But No Air

1, 2, 3, and 4 as described above under "Purge Method." This removes air from the charging tube. The receiving cylinder is partially immersed in a vessel containing cold water or ice water.

5. Close purge valve (C).
6. Open receiving valve (D).
7. When the scale shows the proper amount of refrigerant in the receiving cylinder, close stop valve (B) and small cylinder valve (D).
8. Open purge valve (C) to discharge the line between stop valve (B) and receiving valve (D).

Vacuum Pump Method

Where Receiving Cylinder Contains Air

While the "Purge Method" above outlined involves very little loss of refrigerant, if a vacuum pump is available, purging loss when the receiving cylinder and the charging tube are filled with air may be entirely eliminated.

It is generally not necessary to provide means of producing a temperature difference between the cylinders, if the charging cylinder is on a level above the receiver, since evaporation of the methyl chloride into the evacuated space produces some cooling of the receiver.

Equipment Required

The equipment is the same as in the "Purge Method," with the exception that the suction line of a vacuum pump, equipped with a vacuum gauge, is connected to the outlet of the three-way valve or the free leg of the "tee." This is shown in Fig. 3.

A "tee" in the vacuum line for venting purposes is also desirable.

Procedure

1. With stock valve (A) closed and the other valves open, evacuate the charging line and the cylinder (D).
2. Close the three-way valve (C) or the "tee" outlet valve.
3. Open stop valve (B).
4. When the required quantity of refrigerant has run into receiving cylinder (D), close stop valve (B) and cylinder valve (D).
5. Open valve (C) and the vent valve (G), which leads to the outside air, to allow the escape of the liquid refrigerant between stop valve (B) and receiving valve (D). Disconnect receiving cylinder at (D) and close vent valve (G).
6. When the next cylinder is evacuated, stop valve (B) should be closed, since the charging tube between stock cylinder (A) and stop valve (B) now contains liquid refrigerant. Suction of refrigerant into the vacuum pump should be avoided.

Notes: The above procedures can be used without a three-way valve or a "tee" in the charging line, but in this case the union at valve (D) must be broken to purge or to apply a vacuum. This is more wasteful of refrigerant. The set-up is described in the Artic service manual.

Bureau of Explosives regulations apply to the construction, filling, testing, tagging, and shipping of cylinders used in interstate commerce. Transfer cylinders should meet the requirements of the regulations and should be shipped in accordance with them.

Vacuum Pump Method

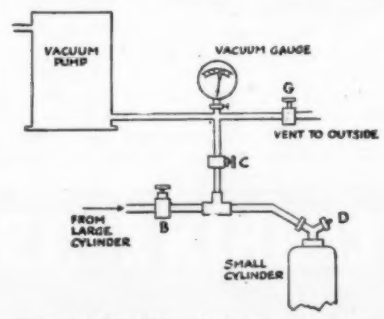

Fig. 3—Modification of set-up to permit use of vacuum pump.

Eustis Tells How Refrigerants Can Best Be Distributed

By A. H. Eustis, President, the Virginia Smelting Co.

THERE have been no important new developments in the nature of new refrigerants in 1934 and 1935. The rush of new refrigerants each with a claim of special advantage seems to have run its course. Possibly it is gradually being realized that a ton of refrigeration is still a ton of refrigeration and the same amount of work has to be done to accomplish it whether the heat transfer medium is a new compound or an old one.

The old refrigerants, ammonia, carbon dioxide, sulphur dioxide, methyl chloride, are still in the field. They still have the same smell but engineers still use them.

The new fluorine halogen refrigerants are being used largely in air conditioning and commend first consideration in this field.

There has been a tendency in some larger cities to revise the fire department codes with the object of securing greater safety in view of the increasing use of refrigeration. This is a highly desirable object, but the authorities should be careful that in avoiding one hazard or annoyance, they do not get into a more serious danger in the case of what has been well called "unfriendly fire."

Used in Smaller Quantities

The increasing use of all refrigerants in small quantities by an ever increasing number of users, emphasizes the question of the best method of distribution.

Machine manufacturers and repair or service men are naturally interested in securing "The Best" quality of whatever refrigerant they use. The machine manufacturer has a double protection, the guarantee of the refrigerant manufacturer and chemical tests made at their own plant.

Most service organizations are not equipped to make the delicate chemical analyses required to prove the quality of the refrigerant. Their protection, therefore, is the guarantee of the refrigerant manufacturer.

With recognized manufacturers of refrigeration grade material, this is 100 per cent good, but the manufacturer can only guarantee his product as far as the original container in which he shipped it.

In case the product is transferred from the factory shipped cylinder to a service cylinder, whatever agency did the transfer must be responsible for the quality.

It is well recognized among refrigerant manufacturers that it is comparatively easy to make a high grade product in the plant receivers, but much more difficult to be sure the product in the shipping containers is perfect.

For this reason, the Virginia Smelting Co. makes two tests on every cylinder shipped even if it holds only four ponds, one to be sure it is clean, the other to be sure of the chemical analysis.

There is a real problem in keeping the cylinders clean. This applies just as much to the service organization or service man who transfers the product from a factory filled cylinder to a service cylinder. The product used is no better than the inside of the service cylinder.

Clean Cylinders Twice a Year

If it is asked, "How does the dirt get into the service cylinder?" I can only say, "I do not know but it does get there in time," and I recommend, therefore, that all cylinders used in the field be cleaned and tested for dirt and moisture at regular intervals, perhaps every six months, perhaps every year.

What applies to the service cylinder applies equally to the connections from the cylinder to the job and to the job itself.

The question then comes, how can refrigerants be distributed to enable the serviceman to be sure he has a high-grade product at a reasonable price?

One way is for the factory to ship in service size cylinders and test each cylinder. This is practical but it costs a little more than for a distributor to buy in larger cylinders and transfer to service sized cylinders. This latter procedure is practical and saves part of the cost, but the service man should recognize that the quality of his product depends on the man who does the transferring and it is to his interest to be sure that this is carefully done and that the service cylinders are cleaned and tested at regular intervals.

He should also make sure that the transferring is done in accordance with the rules of the Bureau of Explosives which are sound and are for the protection of everyone concerned.

Precautions should also be taken that open flames are not used on cylinders. Where this is done there is danger of overheating with resultant lowered strength of cylinder metal, also, danger of melting fuse plugs.

Texaco Engineers Present Data On Lubrication of Refrigeration & Air-Conditioning Systems

By the Engineering Department of the Texas Co.

STUDY of the lubrication of refrigeration machinery as applied to air-conditioning operations has been actively extended over recent years with the markedly increased popularity of comfort cooling. It has been particularly accelerated by the necessity for lubricating oils employed in compressor service to function dependably over extended periods of time, and under a wide variety of operating conditions.

The function of the compressor is especially important, as it must recover the refrigerant or cooling agent after the latter has been evaporated in the cooling side of the system, and then bring it into such a form as to render it again capable of cooling. This cycle must be continuous and positive.

Advances in the study of compressor design, in turn, have led to the adoption of two distinct types of compressors, viz.:

(1) The reciprocating machine, either single or double acting, of one or more cylinders, according to the size of the job and the amount of refrigeration required, and

(2) the centrifugal compressor. This latter is unique by reason of the constant pressures available, and the comparative simplicity of its lubricating system.

In part, this trend in design has been due to the higher loads which must be carried, space limitations, and the physical properties of a group of refrigerating chemicals which have proved especially adaptable to air-conditioning service.

Compressor operations under these conditions impose a definite load upon the lubricant which must be fully anticipated before any such machine is put into service. Otherwise difficulty may result, especially if the oil is not suited to the operating requirements, or to the physico-chemical nature of the refrigerant.

To fully realize the importance of lubrication and its bearing on efficient compressor operation the mechanics of the compression process and the details of compressor design must be thoroughly understood.

An air-conditioning compression system will include a compressor, an oil trap, condenser, expansion valve, and evaporating element. In air-conditioning operation as already stated the compressor may be of either the centrifugal or reciprocating type. Where the latter is involved the principles of single or double acting operation will prevail.

In the compression process the refrigerant or cooling agent is recovered after each expansion by means of mechanical compression. To bring this about the compressor performs three functions in that it serves first as a pump to withdraw gas from the cooling unit through the suction line, and then to compress this gas to a comparatively high pressure prior to discharge into the condenser.

At this point the discharge control serves to divide the low and high pressure sides of the system and maintain maximum efficiency of operation by preventing leakage of the compressed vapor back into the low pressure side.

In the process of refrigeration the gaseous refrigerant which has left the compressor must be cooled to convert it to liquid form. Under compression alone it will still remain as a gas due to the fact that the application of pressure raised the temperature above the liquefaction point.

From the discharge end of the machine the gas is therefore passed to the cooling coils of the condenser where the temperature is lowered by means of air in some smaller types of air-conditioning units, or by cold circulating water in larger installations, to convert this gas into liquid form. It is then capable of serving as a cooling medium.

This is brought about by passing it through an expansion or regulating valve on the expansion side of the system. Here, by virtue of a drop in pressure, it evaporates and returns to its gaseous state.

In so doing it gives up its latent heat of vaporization and as a result is capable of absorbing heat. After suitable circulation through the heat transfer element and air-conditioning unit the refrigerant is then ready for return to the compressor for repetition of this cycle.

Types of Installations

Air-conditioning installations as they are being planned today may be broadly divided into two classifications, viz.:

The centralized, and

The unit type.

Centralized installations are normally designed to serve an extensive amount of space such as would be involved in theaters, restaurants, clubs, hospitals, office buildings, and public halls. From one to an extensive number of rooms can be conditioned by such a system, dependent upon the feasibility of installing the necessary ducts for air circulation.

The compactness of the compressor and other machinery renders location a very flexible matter, from a corner of the power-plant or basement to any available space regardless of floor level.

Unit air conditioning, in turn, is generally applicable to homes, individual office rooms, dining cars, and other railway equipment. Normally a unit installation involves a complete compressor and refrigerating system for each room or compartment to be served.

The centrifugal type of compressor has been widely adapted to central station applications along with the more conventional type of multi-cylinder reciprocating machine.

Miscibility with Lubricating Oils

Certain refrigerants are completely miscible with petroleum lubricating oils. In air-conditioning service we are particularly concerned with Freon, Carrene, and methyl chloride, although there are a considerable number of other refrigerants of chlorinated hydro-carbon nature, or the halo-fluoro derivatives of aliphatic hydro-carbons which must also be considered.

The extent to which the compressor oil in an air-conditioning system may come into appreciable contact with the refrigerant will depend upon the type of compressor.

Centrifugal machines present a comparatively simple problem involving the lubrication of ring-oiled bearings and the maintenance of a seal against loss of vacuum. Normally, a certain amount of leakage of the refrigerant, which is generally Carrene (dichloromethane), will occur; it will not be sufficiently extensive, however, to give any concern as to the resultant lubricating ability of an oil which has been specifically refined for this class of service.

In the reciprocating installation the question of the method of lubrication enters into the problem. Small tonnage units designed for splash lubrication, as are so many of the vertical unit type railway or household machines, depend upon oil thrown from the crank to splash the necessary amount of oil to the cylinders and bearings.

Where there is possibility of some of this oil passing over to the high pressure side to become mixed with the refrigerant, there is provision for return directly to the crankcase.

In such machines an oil level regulating device is therefore frequently installed, although if care is observed not to charge the compressor with too much oil to begin with, oil level regulation may not be necessary; it is therefore not always used on the small unit type of machine.

In other designs oil is returned to the condensing unit by the velocity of the refrigerant vapor.

The reciprocating compressor can also be built so that the refrigerant vapors are kept entirely apart from the crankcase. In such machines the possibility of mixture with oil at least at this point is largely eliminated. This enables the oil to maintain its original viscosity, or merely to follow the normal reduction in viscosity which would take place as the crankcase comes up to average operating temperature.

This condition will prevail in the enclosed crankcase machine equipped with trunk-type pistons and designed for pressure lubrication. The oil pump maintains positive circulation of oil without excessive splash effect, therefore, foaming is markedly decreased.

Reduction of oil splash in turn reduces the tendency of any refrigerant present to mix with the oil supply, especially as there is no circulation of refrigerant vapors within the crankcase.

Location of the oil pump in such a machine must of course be carefully studied. Some authorities recommend that it be at the lowest point in the case to insure against loss of suction and the resultant reduction in volume

(*Continued on Page 12, Column 1*)

Design of Westinghouse Unit for Air-Conditioning Use

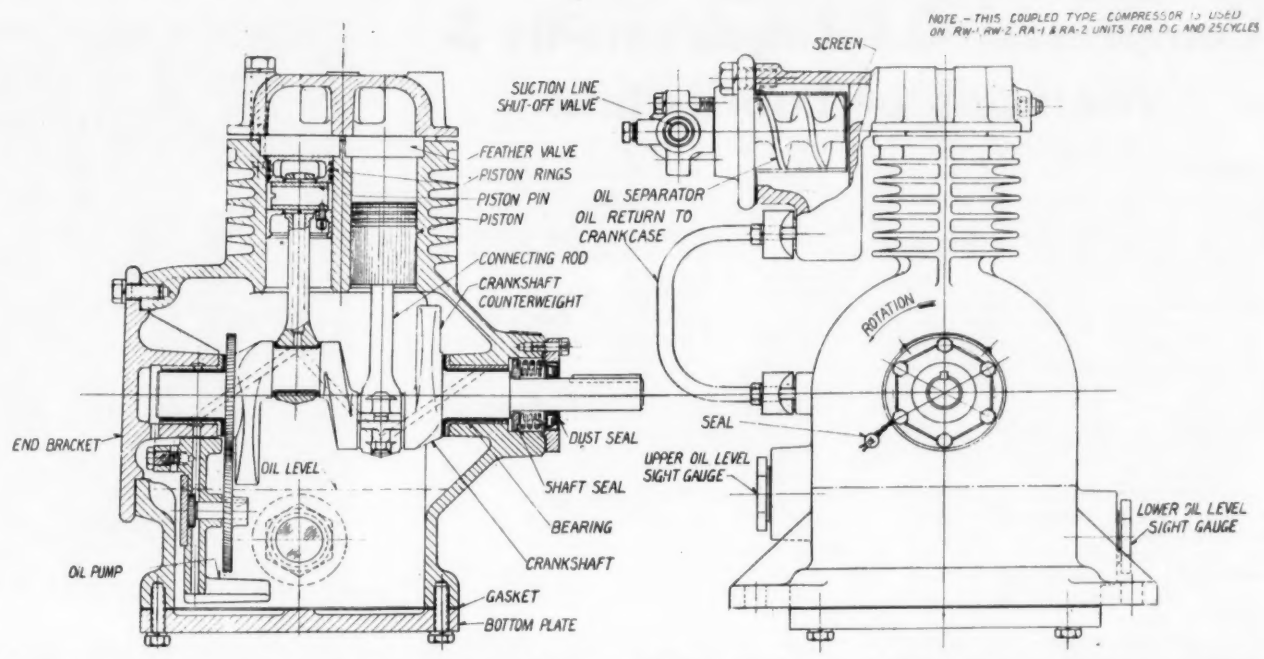

Fig. 2—Detailed view of a Westinghouse compressor designed for air-conditioning service, showing oil level in the crankcase and means of circulation. Of special interest is the location of oil separator and oil return.

'Insides' of G-E Compressor

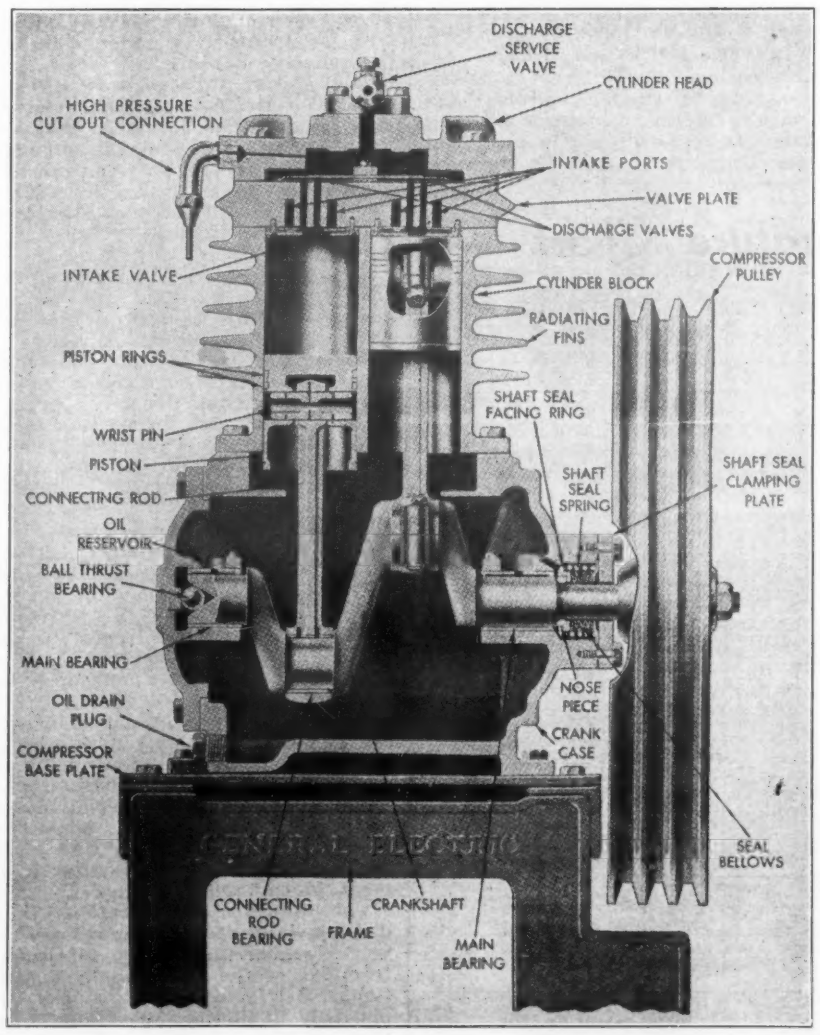

Fig. 1—Sectional view of the General Electric CM compressor, showing details of construction. Note in particular bearing design and relative location of lubrication elements.

REFRIGERANTS AND OILS

Compressor Oil Requirements & Methods of Lubrication

(*Continued from Page 11, Column 5*)

of oil circulated which might readily lead to impaired lubrication; others feel that a settling chamber below the pump is an advantage.

The cross head type of vertical compressor as well as the horizontal double-seal stuffing box machine are also adaptable to large tonnage central station air-conditioning service. In these units the refrigerant vapors are also kept out of the base or crankcase of the machine; instead they are returned directly to the cylinder block.

As a result there is no possibility of the oil in the case becoming mixed with refrigerant, so here again foaming, especially with Freon, is eliminated along with reduction in viscosity.

Since lubrication of the crankcase elements or external parts is maintained entirely independent from the cylinders, it is customary to provide for injection of a certain amount of oil into the refrigerant return line or directly to the cylinder and stuffing boxes to take care of piston and valve lubrication and protection of the cylinder walls against scoring.

Factors Governing Absorption of Freon by Lubricating Oil

Apart from mechanical and constructional conditions the amount of Freon which may be absorbed by any mineral oil will be dependent upon the viscosity of the oil at the temperature of contact and the pour test of this oil; pressure also becomes a factor.

In other words, larger amounts of Freon are absorbed by mineral oils at higher pressures and lower temperatures, just as smaller amounts of this refrigerant will be absorbed at lower pressures and higher temperatures. In addition, lower viscosity oils absorb less Freon for a given weight than will lubricants of higher viscosity.

Lubricating Oil Requirements

Viscosity Range

This matter of mixture of petroleum lubricating oils with refrigerants of halogen combinations must of course influence the original selection of such lubricants from the viewpoint of viscosity. In other words when dealing with lubrication of a compressor charged with Freon or methyl chloride, an oil of somewhat higher original viscosity must be used than would be necessary were the refrigerant to be non-miscible with such an oil.

Theoretically a wide range of operating and constructional conditions exist which should be given careful consideration. Unfortunately, however, these may occur in such a variety of combinations as to render it necessary to adopt a broad grouping of oil characteristics contingent upon the most influential factors such as speed, intake, and discharge temperatures, means of cooling, and the method of application of the oil.

For example: In a small capacity enclosed type slow-speed machine operating from an evaporator temperature around 0° F., an oil of from 150 to 300 seconds Saybolt viscosity at 100° F., will be advisable, the higher viscosity range being approached in accordance with positive information as to the normal content of refrigerant.

Some interesting test data have been developed to indicate that this will be from 10 to 12 per cent in average service. To realize the extent to which this will reduce the viscosity of a 300 viscosity oil one should refer to the accompanying charts.

In brief, using an oil of this viscosity in an enclosed reciprocating machine operating at 130° F., crankcase temperature and 40 lbs. suction pressure, reference to Fig. 5 shows a normal Freon content of approximately 11 per cent.

Subsequent reference to Fig. 6 indicates that with such a Freon content the atmospheric viscosity of the mix-

Absorption of Freon

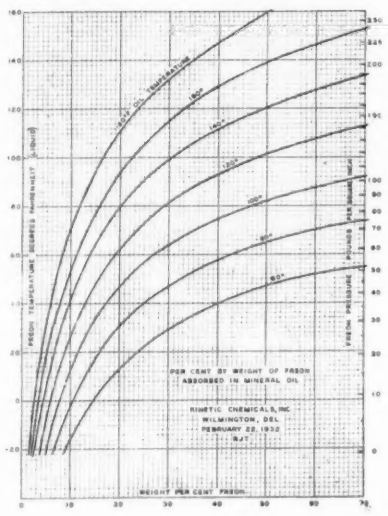

Fig. 3—Chart showing per cent by weight of Freon absorbed in mineral oil for various temperatures and pressures.

ture at 100° F., will be around 70 seconds Saybolt.

As one approaches higher speed, load, or tonnage conditions, however, such as might prevail in the central station installation or on the relatively high speed railway compressor, an increase in viscosity is deemed advisable, with proportionately less stress being attached to the pour test of the oil due to the higher operating temperature range.

In such installations the oil viscosity may have to range from 300 to 900 seconds Saybolt at 100° F., according to type and capacity of the compressor.

Flash Point

While the average air-conditioning compressor will function at maximum temperatures considerably below 200° F., there will be times when an installation of the booster type may approach 250° F., on the discharge side.

For this reason the flash point as an indication of the relative vaporizing tendency of petroleum lubricating oil must be given consideration. Fortunately, the flash point of even the lower viscosity oils will be sufficiently above 350° F., to preclude any abnormal vaporization and thickening of the oil.

A further indication of the degree of refinements is the extremely low tendency to form carbon residue on heating, which will be shown by such oils.

Corrosion and Resistance to Breakdown

The tendency which any petroleum lubricating oil will have to bring about the above reactions will be more or less a measure of the method of refinement. In the interest of reducing the corrosion tendency it is especially essential that the water content be practically nil; this is also necessary to prevent freezing at the regulating valve and possible restriction of flow of refrigerant.

Water would also freeze in the cooling coils, to reduce evaporative efficiency. A dehydrated oil is also advisable to prevent possible chemical dissociation of Freon, which might lead to serious damage to the machine parts through acid formation.

Results which may accrue from chemical breakdown of the oil itself will be very disturbing in the average air-conditioning installation regardless of the type of refrigerant used, for it will lead to gum formation and actual stopping of the unit.

Resistance to breakdown is determined by the petroleum chemist in terms of resistance to oxidation. A variety of interesting tests have been developed to enable accurate prediction of this tendency and to guide him in development of refinery methods which will effectively remove those hydro-carbon constituents which may be unstable and thereby most readily susceptible to chemical dissociation.

It is this latter which is regarded as being the basic cause of gum formation, and deposition of residual matter around piston rings, or in bearing oil grooves. Its formation is materially accelerated by heat in the presence of moisture, or by the solvent action of certain chemicals.

Physical Effects of Temperature

Effect of cold upon petroleum lubricating oils is not the same as upon simple fluids such as water, alcohol, glycerine, etc. Such products have fixed and accurately ascertainable freezing points at which a complete change from the liquid to the solid phase takes place.

Lubricating oils, however, which are complex mixtures of hydrocarbons of various melting points or freezing points, behave like solutions and frequently deposit some portion of their constituents before the whole mixture solidifies.

This fact must be thoroughly recognized when specifying and refining such oils for air-conditioning compressor lubrication, in conjunction, of course, with the minimum operating temperatures to which any such oil may be subjected.

Fortunately, in average air-conditioning service these temperatures will not be as low as in some types of refrigeration work. They will, however, be sufficiently extreme to render the pour test one of the principal characteristics to be investigated in a study of lubricating oils for such service.

The varied behavior of certain types of petroleum oils when subjected to low temperature conditions has led to exhaustive study of methods of test, to determine accurately when congealment begins and fluidity becomes retarded.

Where we are concerned with lubrication of compressors applied to air-conditioning installations this knowledge becomes of considerable value in the initial selection of lubricating oils which will possess adequate fluidity to enable ready handling by the conventional types of oil-circulating systems, and maintain protective lubrication of the parts to be served.

Obviously the oil must also remain comparatively fluid at the lowest temperatures to which it may be subjected during operation. These temperatures will usually be encountered in the expansion or refrigerating side of the system after the refrigerant has passed the expansion valve.

Should the refrigerant be carrying a high percentage of oil at this point, any tendency towards wax congealment might lead to faulty operation of this valve or insufficient heat transfer. The pour test is indicative of the extent to which this may be expected. In the terms of the American Society for Testing Materials—"the pour point of a petroleum oil is the lowest temperature at which the oil will pour or flow when it is chilled, without disturbance under definitely prescribed conditions."

The proviso in regard to disturbance is especially important. Extensive research has developed that any agitation or stirring of the oil while cooling in a pour test determination is contrary to good practice. When an oil is stirred it solidifies at a lower temperature than when held absolutely motionless.

This is explained by the assumption that the movement of the oil destroys the formation of a fine network of microscopic particles of paraffinic bodies in the course of separation. This segregation is regarded as giving the oil a certain amount of support, to thereby facilitate solidification. The test procedure should therefore provide for absolutely motionless cooling.

Effect of Wax Content

Prior to the development of the several highly successful dewaxing processes which are now in general usage, pour test of a petroleum lubricating oil was deemed to be chiefly dependent upon the base of the oil and to some extent upon the viscosity.

Today, however, the art of dewaxing has been so highly developed as to render pour test more definitely dependent upon the method of refinement, although the derivatives of naphthenic base crudes possess a naturally lower pour test and hence do not require such exacting treatment in the refinery process.

The sequence of operations is of distinct interest. The first step involves segregation of the lubricating fractions of the crude oil by distillation. Refrigerating oil stocks are normally distillates; these stocks are then subjected to chemical treatment and filtration.

Oftentimes they are carried through a dewaxing process whereby the wax content is largely removed by crystallization and mechanical treatment, including further filtration, chilling, or centrifuging. The wax content will normally be the controlling factor in regard to pour test or relative fluidity at low temperatures.

All petroleum products contain a certain amount of wax. It is more pronounced, however, in crudes of paraffin base than those of naphthene base. Wax is also more difficult to remove from the former, as a result, unless a paraffin base stock has been especially dewaxed it will show a considerably higher pour test than a naphthenic base oil of the same viscosity.

The dewaxed oil is finished or given final refinement by redistillation, chemical treatment, solvent extraction, or filtration. Any of these processes may be used individually or in various combinations with one another. The ultimate objective, however, is the same in all cases, i. e., to increase the resistance to breakdown, lower the pour test, and improve the chemical stability of the oil.

Frigidaire 4-Cylinder Model

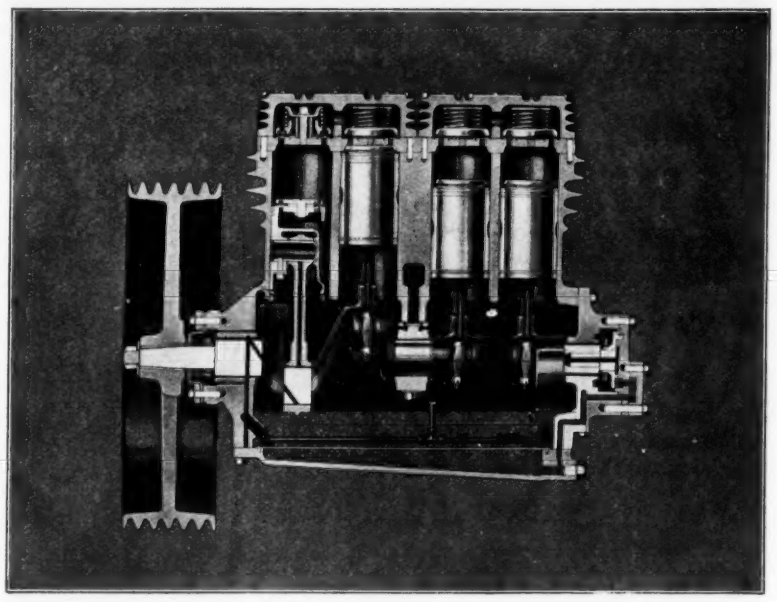

Fig. 5—Cutaway view of the Frigidaire 4-cylinder compressor for heavy duty applications. Lubrication is entirely automatic.

Methods of Lubrication

Splash, pressure, or circulated lubrication by means of ring oilers, have proved the most adaptable methods of lubricating air-conditioning compressors. Splash oiling is best adapted to the small tonnage, enclosed-type, vertical reciprocating machine.

Forced-Feed System

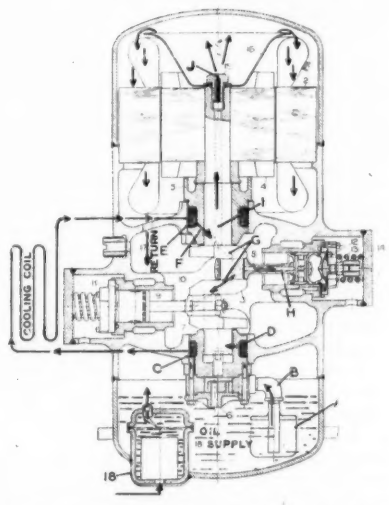

Fig. 6—A De La Vergne air-conditioning unit. The oil pump, No. 6, takes oil from the oil supply by means of the strainer "A" through suction pipe "B" and discharges into chamber "C." Part of the oil goes through hole "D" and lubricates the lower end of the crankshaft. From chamber "C" the oil passes through the cooling coil which is mounted outside and comes back to the compressor into chamber "E." From "E" the oil lubricates the shaft through hole "F" and lubricates the connecting rods by the drilled holes "G." Wrist pin lubrication is taken care of by hole "H" in the connecting rod. The rest of the oil is passed through the shaft hole "I" and through nozzle "J" and splashed over the coils of the stator and from there falls by gravity through slots on the outside diameter of the stator into the lower part of the crankcase indicated as "oil supply" in the drawing. The oil trap No. 18 is the means of discharging the oil which has collected in the system back into the compressor. Arrows indicate flow of oil.

Pressure lubrication in turn by means of an enclosed gear pump, an oscillating cylinder reciprocating pump, or, an external force feed lubricator is applicable to the larger type vertical or horizontal unit; whereas the ring oiler in conjunction with force feed, for sealing purposes has proved especially adaptable to the bearings of the centrifugal machine.

Splash Oiling Systems

In a splash system the oil is distributed at each revolution of the crank, the level in the crankcase being maintained just high enough to permit the crank to dip and splash the necessary amount of oil to the cylinder walls, etc. Continued operation will result in the crankcase being filled with a lubricating vapor above the main body of oil, which will also insure adequate lubrication of main, wrist pin, and crank pin bearings.

When recharging the case with oil the level must never be raised too high. Otherwise, oil would be churned by the crank, bringing about such violent agitation as oftentimes to

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Viscosity Temperature Chart

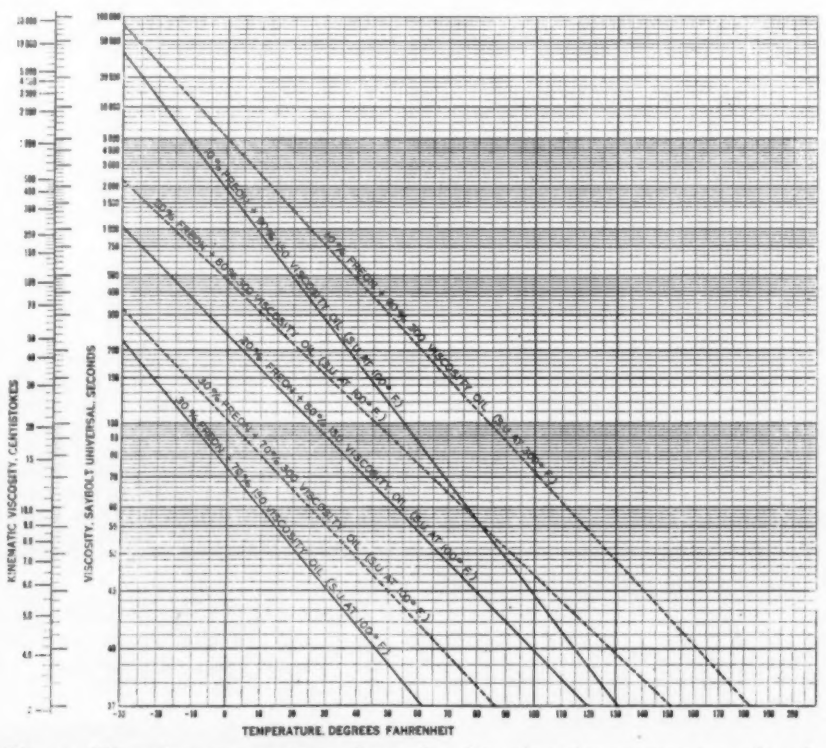


Fig. 4—Viscosity temperature chart showing viscosity curves for oils of 150 and 300 seconds, Saybolt universal viscosity, at 100° F., when diluted with 10, 20, and 30 per cent of Freon.

Lubrication Methods In Refrigeration and Conditioning Units

(*Continued from Page 12, Column 5*)

preclude effective precipitation of any impurities that may have gained entry.

There would also be possibility of loss of lubricant past the piston with subsequent entry of an excess of oil into the condensing and evaporating parts of the system; or increase in the rate of mixture with the refrigerant.

This can be partly overcome by proper adjustment of the piston rings. Where the latter are not sufficiently tight, if the crankcase contains too much oil or agitation is too violent, the excess which naturally will reach the cylinder walls will tend to work past the rings.

This is not only wasteful, but a detriment, for if the oil is not of sufficiently low pour test there will be a possibility also of its congealing within the system, to act as an insulator and reduce refrigeration to a marked degree. The presence of oil in the system may also cause a higher condenser pressure by reason of the vapor pressure produced by the oil.

Use of excess oil in a splash lubricated system will also involve the possibility of difficulty when draining and cleaning, especially where sludging has taken place. Churning of certain oils in a crankcase will give rise to sludge formation if they have not been very highly refined. In part, this is due to oxidation; it will be most probable where water is present or the oil is laden with foreign matter, such as dirt, metallic particles, or carbon.

It is, therefore, important to follow regular periods for cleaning, and to look carefully into the condition of the used oil, for this will very often indicate both the approximate suitability of the latter and the extent to which effective lubrication is being attained.

Pressure Lubrication

With a pressure system, more accurate control of the amount of oil delivered to cylinder walls and compressor bearings is made possible. On the other hand, some types of design may require more equipment, piping, etc., frequent filling of the reservoir where a mechanical force feed lubricator is installed, and regular attention from the operator.

In the central station type of installation pressure lubrication is especially adapted to cylinder and rod lubrication via the oil lantern, or oil recess within the piston rod stuffing box.

By properly constructing a stuffing box with a lead to come from the lubricator, it is possible to operate the piston rod continually through a ring of oil. In this way effective rod lubrication, as well as sealing against pressure, can be maintained.

To lubricate the cylinder in addition, it is only necessary to deliver additional oil to the stuffing box lantern and provide a so-called overflow pipe to carry this to the refrigerant suction line adjacent to the cylinder. In effect, this is similar to the principles of steam cylinder lubrication, the refrigerating gas being impregnated with vaporized lubricant prior to its passage through the compressor.

Mechanical force feed lubricators can also be used where compressor cylinders are to be pressure oiled. Excellent economy will be attained by regulating such lubricators so that just enough oil is delivered to maintain the requisite lubricating films, with the least amount of excess to drain off.

Carbondale Freon Compressor

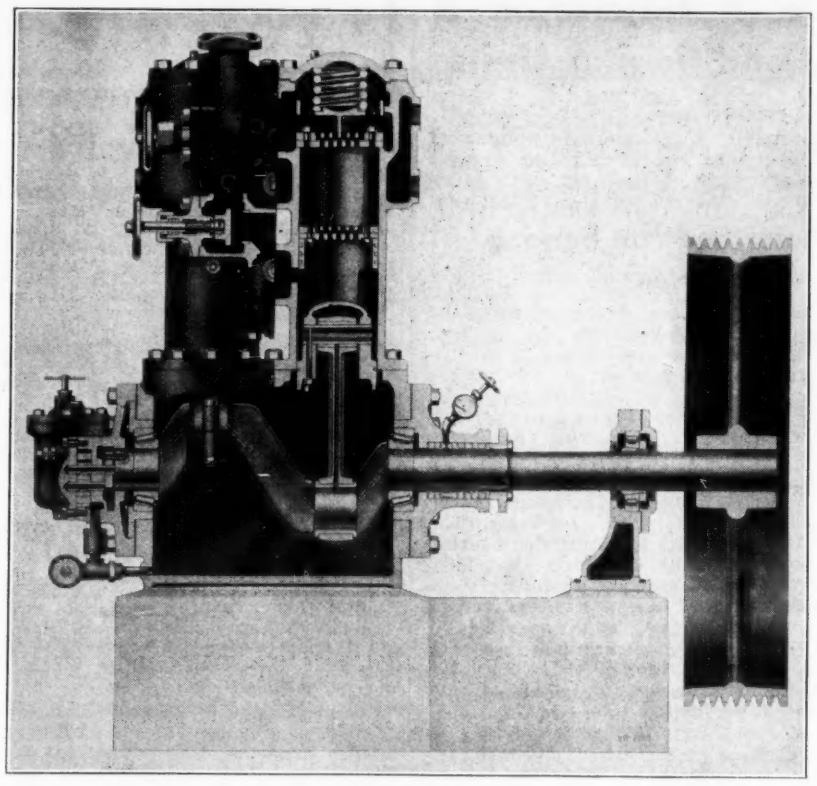


Fig. 7—Sectional view of a Carbondale vertical, 2-cylinder, Freon compressor. Note use of the tapered roller bearing on the crankshaft, details of lubricating system for automatic and positive circulation of oil, and design of the stuffing box.

Enclosed Oil Pump Design

In realization of the necessity for controlled lubrication, certain compressor builders have given some noteworthy study to the application of the enclosed type of force-feed oil pump.

One particular design has provision for location of this pump in the base of the crankcase, driving through sprockets by chain connection to the main shaft. By locating the pump also at the lowest part of the case the possibility of loss of suction is eliminated inasmuch as the oil is continually being returned by gravity. This assures positive delivery of oil to all reciprocating parts through the pipe connections provided for same.

Ring-Oiled Bearing

Lubrication by means of the ring oiler is applicable to the outboard bearings of the crankshaft in certain types of heavy duty reciprocating machines and to the rotor bearings of the centrifugal compressor.

In connection with the latter the oil performs a dual function in that it not only lubricates the bearings but also maintains an automatic oil seal against loss of vacuum. This seal at the drive end of the centrifugal compressor is obtained through an automatic mechanism actuated by the oil pressure developed during operation, and by springs when the machine is at rest.

The principle of operation, according to Carrier Engineering Corp.—"comprises a rotating and a stationary disc, held in position by the oil pressure and separated from actual wearing contact by a film of oil under pressure. When the machine is stopped and the oil pressure ceases compression springs are automatically released and these then effect an equally dependable and leakproof seal while the machine is inoperative."

As a means of lubrication the ring oiler is simple, clean, entirely automatic, uniform in oil distribution and requiring of but little attention. In construction it comprises a bearing housing which is built with a reservoir and a slot of sufficient width and depth in which revolve one or more rings suspended from the shaft, according to the length of the bearing; the turning of the shaft causes the rings to rotate.

By this action a certain amount of oil is carried to the top of the shaft from whence it flows into the bearing oil grooves and clearance space to be ultimately distributed over the entire wearing surface. The oil, after passing through the bearing, flows out to the end or ends of the shaft and back to the reservoir to a return chamber which is part of the bearing housing.

A ring-oiled bearing is flood-lubricated with a considerable excess of oil over the amount necessary to furnish the requisite oil film. Bearings designed for this type of lubrication may be said to be doubly protected in that the oil serves not only as a lubricant, but also as a cooling medium to carry away part of the frictional heat developed, thereby reducing the temperature of operation.

If the oil reservoir in the base of the bearing has been properly designed and is of sufficient capacity, this overheated oil in turn becomes sufficiently cooled after each circulation to enable it to perform this heat transfer function indefinitely.

Oil splash or churning is objectionable in the centrifugal compressor due to the possibility of impairment of the seal. For this reason oil which is carried to the top of the bearing on this machine must be returned to the reservoir as rapidly as it is delivered by the ring in order to avoid undue accumulation in the upper part of the housing. The same condition might arise if the oil is carried too high in the well, or if the ring is too small or rotates too rapidly.

Piston Ring Installation

Use of piston rings in the reciprocating type of air-conditioning compressor will be dependent upon the size and design of the machine.

Rings are always used in the horizontal compressor; in the smaller unit type of vertical machines, however, piston rings may be eliminated in favor of closer clearance or a tighter fit between the pistons and cylinders. This practice, on the other hand, requires very accurate machine work and thorough knowledge of materials and their susceptibility to wear.

In the interest of maintenance of a suitable seal, and preventing abnormal passage of lubricating oil from the crankcase into the refrigerating side of the system, some very interesting studies have been made in regard to ring design, materials, and installation. It has been indicated that the conventional type of soft iron ring is not always dependable due to the tendency it may have to warp or bend, especially when being installed. Any deformation may, of course, lead to binding or even sticking in the ring grooves.

Obviously this may result in faulty lubrication, an imperfect seal, and

(*Concluded on Page 14, Column 3*)

Separator & Pump

Fig. 8—Westinghouse oil separator and oil pump. The former extracts oil from the refrigerant by centrifugal and baffle action. A strainer is also built in to prevent possibility of entry of foreign matter. The oil pump is of the automotive type.

Lubrication Methods On Refrigeration & Conditioning Units

(*Concluded from Page 13, Column 3*)

passage of a considerable volume of oil over into the refrigerating or heat transfer side of the system to cause reduced efficiency of the entire unit.

Motor and Fan Bearing Lubrication

Electric motor bearings and the bearings of other accessories such as fans, which are essential to a mechanical air-conditioning system, are largely of the anti-friction type. In addition, the ball bearing hanger has been widely adopted in connection with railroad car air-circulating systems.

Lubrication of such bearings should differ but little from the lubrication of the industrial ball or roller bearing motor, with the exception that location in confined spaces might, in some cases, tend to cause higher average bearing temperatures in operation.

The first cost of such bearings may be somewhat higher than the conventional plain bearing. Positive protection to justify this cost is, therefore, essential. Such protection is assured by lubrication provided the proper lubricant is used.

Normally, the design will call for a grease, the bearing seals being so designed as to enable such a lubricant to function at its best, apart from contamination from external sources. This will assure easy rolling of the bearing elements, with minimum friction and wear.

Rolling motion must be maintained as perfectly as possible, however, for if it is impaired in the case of even but one ball or roller, more or less sliding will occur to the detriment of the contact surfaces of itself as well as the raceways.

Adequate sealing is highly important on any air-conditioning installation, not only as a protection against contamination, but also in the interest of preventing leakage and necessity for frequent renewal of grease. It is obvious that positive protection of the bearing elements cannot be assured if the lubricant is prematurely lost, furthermore, leakage, especially in a railroad car installation where the fans and motors may be located overhead in a space above the doors, might readily cause considerable expense and discomfort to passengers should this leakage drip through and onto clothing.

While a tightly sealed bearing will, of course, permit the use of a lighter lubricant, which will lead to reduction in torque and power consumption, the matter of temperature must not be overlooked, for temperature will affect the consistency of any grease.

Research in grease manufacture has developed a type of lubricant which is possessed of certain highly desirable properties, in that it resists change in consistency and even at higher temperatures it will train with the bearing and not work out. Furthermore, it is remarkably low in torque characteristics. From a chemical angle, it is free from acid forming tendencies which assures protection against corrosion, and is resistant to oxidation or expansion through air entrainment.

These properties, along with an ability of the lubricant to resist oil separation, should be most carefully considered in the purchase of grease for any ball or roller bearing.

Application or renewal of lubricant is also important. One should never force an excess of grease into any anti-friction bearing housing by either a compression grease cup or pressure gun. The latter must be handled especially carefully due to the potential pressures available.

If pressure is not controlled the charging of too much grease may affect the tightness of the bearing seal. An excess of grease in the bearing may also lead to overheating as well as increase in power consumption.

For these reasons, operators and maintenance mechanics should realize that any ball or roller bearing has a certain limited capacity for lubricants which should not be exceeded. Unfortunately there is no direct way of determining this, hence the advisability of removing the bearing caps, and inspecting at overhaul periods.

Experience with bearings of various size, and knowledge of the effectiveness of their seals, along with the lubricating ability of certain greases, will soon enable an observant operator to develop a suitable lubrication schedule which will assure bearing protection and economy of lubricant.

Doehler Perfects Alloy For Die Casting

NEW YORK CITY—A new brass die casting alloy, known as Doler-Brass, has been announced by Doehler Die Casting Co. here.

The alloy is composed of copper, brass, and silicon, and is said to be especially adapted to the die casting process.

PATENTS

Issued Sept. 17, 1935

2,014,526. THERMOSTATIC VALVE. Francis L. Henning, Boston, Mass., assignor of one-half to Jacob A. Stryker, Arlington, Mass. Application June 28, 1933. Serial No. 678,016. 4 Claims. (Cl. 236—12.)

2,014,541. PRESSURE REGULATING VALVE. Fred W. Wappat, Pittsburgh, Pa. Application Sept. 15, 1934. Serial No. 744,178. 7 Claims. (Cl. 277—20.)

2,014,550. REFRIGERATING APPARATUS. Clarence Birdseye and Bicknell Hall, Gloucester, Mass., assignors to Frosted Foods Co., Inc., Dover, Del., a corporation of Delaware. Application Jan. 20, 1931. Serial No. 509,992. 24 Claims. (Cl. 62—104.)

2,014,587. LATCH. Gordon E. Roedding, Grand Rapids, Mich., assignor to Grand Rapids Brass Co., Grand Rapids, Mich., a corporation of Michigan. Application May 21, 1934. Serial No. 726,714. 5 Claims. (Cl. 292—224.)

2,014,590. SHOW CASE REFRIGERATOR. Ernest E. Sanders, Detroit, Mich. Application May 1, 1933. Serial No. 668,768. 2 Claims. (Cl. 62—89.5.)

2,014,647. REFRIGERATOR DRAWER. Arthur J. Feltault, Bloomfield, N. J., assignor to Efesem, Inc., New York, N. Y., a corporation of New York. Application July 24, 1931. Serial No. 552,847. 4 Claims. (Cl. 259—102.)

2,014,703. REFRIGERATING APPARATUS. Lawrence C. Smith, Buffalo, N. Y., assignor to Fedders Mfg. Co., Inc., Buffalo, N. Y. Original application March 23, 1932. Serial No. 600,604. Divided and this application Oct. 18, 1934. Serial No. 748,845. 3 Claims. (Cl. 62—126.)

2,014,716. THERMOSTATIC CONTROL. Fred W. Birtch, Lexington, Mich., assignor of one-half to Harry A. Shaw. Application Aug. 17, 1932. Serial No. 629,101. 11 Claims. (Cl. 200—137.)

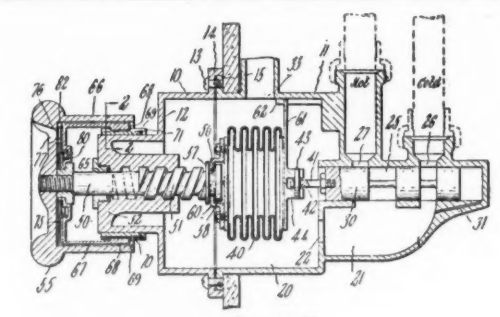
2,014,830. REFRIGERATOR DISPLAY CASE. Robert S. Ahrens, St. Paul, Minn., assignor to Seeger Refrigerator Co., St. Paul, Minn., a corporation of Minnesota. Application May 23, 1932. Serial No. 612,978. 6 Claims. (Cl. 62—37.)

2,014,917. DOMESTIC REFRIGERATION. Walter W. Williams, Bloomington, Ill. Application July 15, 1933. Serial No. 680,535. 2 Claims. (Cl. 62—116.)

2,014,943. HUMIDITY RESPONSIVE DEVICE. Fredrick S. Marcellus, Scotia, N. Y., assignor to General Electric Co., a corporation of New York. Application March 31, 1932. Serial No. 602,182. 7 Claims. (Cl. 297—1.)

2,014,959. AIR CONDITIONING. Reuben H. Anderegg, La Crosse, Wis. Application Nov. 28, 1934. Serial No. 755,248. 11 Claims. (Cl. 257—8.)

2,014,983. TUBING. Bert L. Quarnstrom, Detroit, Mich., assignor to Bundy Tubing Co., Detroit, Mich., a corporation of Michigan. Application May 21, 1934. Serial No. 726,858. Renewed Aug. 14, 1935. In Canada March 7, 1932. 3 Claims. (Cl. 137—75.)



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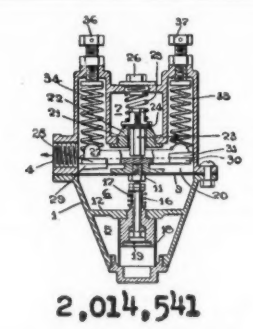

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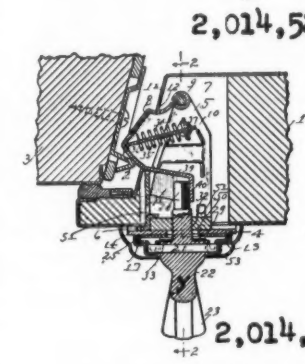

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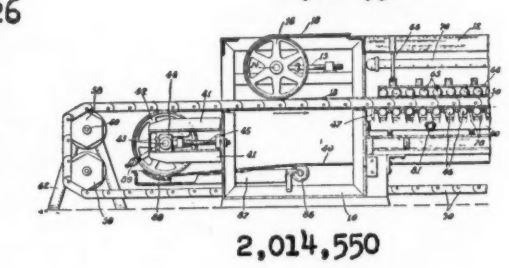

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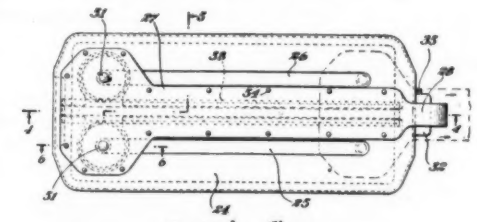

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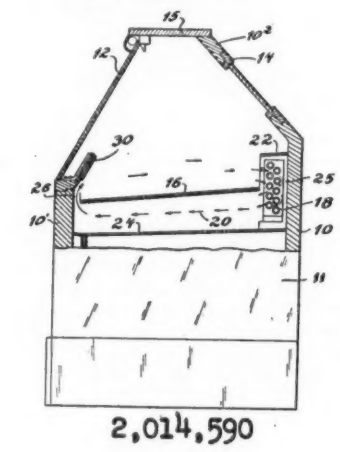

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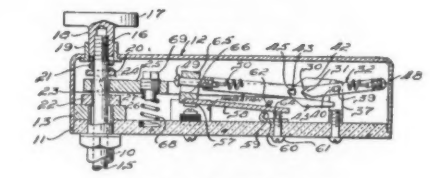

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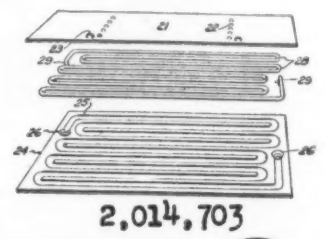

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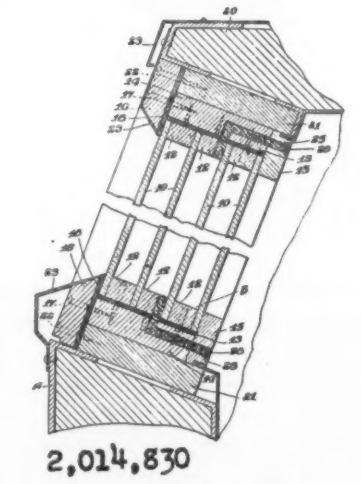

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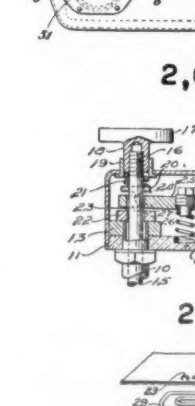

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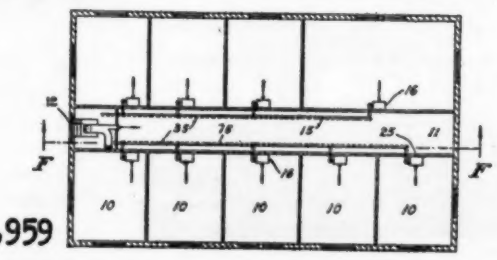

2,014,959

READ CAREFULLY the current issues of the NEWS. Emphasis is being placed on *parts, materials,* and *supplies.* As a preview of new products, improvements, and plans which will have a part in refrigeration merchandising in 1936, these issues will be laden with information for everyone who is alive to the opportunities of the coming year.

Oct. 9—Motors and Controls

New features of motors and controls for refrigeration and air-conditioning applications will be outlined and special editorial attention will be given to the care and servicing of these items.

Oct. 16—Cabinet and Cabinet Parts

New styles in cabinet design and construction will be described and illustrated in this issue, and the editorial spotlight will be focused on cabinet finishes, insulation, gaskets, break r strips, shelves, and nameplates

Oct. 23—Installation and Service Tools

Service and installation men are constantly on the lookout for new tools and equipment which will enable them to do a better job and with less time and effort. The Oct. 23 issue will describe the design and application of newly developed instruments manufactured particularly for use by the refrigeration service man.

Oct. 30—Evaporators

This issue will deal with new developments in evaporators for both household and commercial applications. Other parts designated for special attention in this issue are ice cube trays, and ice cube tray accessories.

Nov. 6—Refrigerator Accessories

Accessory items for use with household electric refrigerators have become increasingly important in the past few years, and this issue will tell what's going to be available for the "inside" of 1936 models.

Manufacturers of cabinets and cabinet parts should reserve space now for the issue of October 16.

ELECTRIC REFRIGERATION NEWS, 5229 Cass Ave., Detroit

Subscription Order

Business News Publishing Co.
5229 Cass Ave., Detroit, Mich. Date.....

☐ Enter my subscription to Electric Refrigeration News for one year (52 issues).
☐ Send the 1935 Refrigeration Directory and Market Data Book (2 volumes).
☐ Enclosed find remittance. (See rates above.)

Name .....

Attention or In care of .....

Street Address ..... City and State .....

We sell the.....refrigerator and.....
(Please indicate other products or principal line of business.)
10-2-35

QUESTIONS

Ice Co.'s Selling Units

No. 2486 (Manufacturer, Manitoba)—"Could you advise us as to the number of ice companies who sell electric refrigerators in the United States and Canada, and give us some idea as to their sales, or, lacking this information, some general idea as to what success ice companies have in selling electric refrigerators."

Answer: We have no statistics on the number of ice companies which are now selling electric refrigerators, but we'd venture a safe guess that the number is very, very small.

A story about one ice company which is selling electric refrigerators was published on page 6 of the July 10 issue of ELECTRIC REFRIGERATION NEWS.

Nema Sales in Florida

No. 2487 (Distributor, Florida)—"Can you supply us with Nema figures showing shipments of electric refrigerators into Florida for each month of 1935 by members of this association?

"We know that this information is published monthly in your fine paper but we have misplaced some of our copies and will appreciate anything you can do to assist us."

Answer: The Nema figures for shipments of electric refrigerators into Florida for the first seven months of 1935 are as follows:

Jan., 1,642; Feb., 1,037; March, 2,318; April, 3,385; May, 3,104; June, 2,249; July, 2,201.

Portable Refrigerators

No. 2488 (Manufacturer, Ohio)—"Our refrigerator distributor has received an inquiry for a small portable refrigerating unit that could be used in a trailer or house car.

"Our refrigerators cannot be recommended for this type of installation and therefore we are transmitting this request to you with the thought that possibly you may know the name of the manufacturer offering equipment suitable for this purpose."

Answer: The Waukesha Motor Co. of Waukesha, Wis., manufactures a small gasoline-operated "cold chest" with 3.16-net cu. ft. capacity, which may fill your need.

Air-Conditioning Sales

No. 2489 (Manufacturer, New Jersey)—"I would appreciate your sending me the sales volume done on the sale of air-conditioning equipment over the period of the last three years. If it is possible, have this broken down by companies—also as to whether it is on the basis of retail sales or on the manufacturers' sales price to distributors; also, any other pertinent information as to the potential volume there is in the air-conditioning field."

Answer: All of the available statistical information on sales of air-conditioning equipment is tabulated in the 1935 REFRIGERATION AND AIR CONDITIONING MARKET DATA BOOK.

We have not obtained information on sales of air-conditioning equipment by companies and, so far as we know, this information is not available.

Revolving Trays

No. 2490 (Foreign Sales Manager, New York)—"We are desirous of obtaining a list of manufacturers of a revolving refrigerator tray, similar to the "Scurlock Kontanerette" and would appreciate this information, provided you are in a position to furnish same."

Answer: Manufacturers of refrigerator dishes are published on page 254 of the 1935 REFRIGERATION AND AIR CONDITIONING DIRECTORY.

Sales by States

No. 2491 (Newspaper, Iowa)—"We have been keeping a record of the sale of household units by states, as reported in the ELECTRIC REFRIGERATION NEWS.

"I do not seem to be able to find the sales by states reported since the month of May, 1935. Have the June figures been released as yet? If so, in what issue were they published, or if they have not been published, will you send them to us?"

Answer: See below.

No. 2492 (Advertising Agency, Ohio)—"We have received your card in answer to our request as to what issue contained the figures on refrigerator sales by *states* for the month of June.

"It was not necessary for us to wait for the July 31 issue you are sending us as we have a complete file of the NEWS.

"It is true the July 31 issue contains refrigeration statistics, but after careful checking we fail to find the ones we are in need of, namely refrigeration sales by *states,* for the month of June.

"We prepare a cumulative report of these figures for one of our clients and cannot go ahead without the June figures. The ones for July appear in the September 11 issue."

Answer: The June report of sales of refrigerators by states was late and not published. ELECTRIC REFRIGERATION NEWS will send copies of the report to subscribers on request. July refrigerator sales by states were published in the Sept. 11 issue.

Cadmium Plating

No. 2493 (Service Company, District of Columbia)—"Sometime ago I noticed in one of your editions a formula and set-up for cadmium plating refrigeration parts. I intended to keep this issue, but in some way lost it.

"Would appreciate it very much if you could send me this information and also if you know of a formula and set-up for copper plating would like to have this too."

Answer: A diligent search of our files does not reveal an article that exactly meets your description. However, an article touching on cadmium plating was published starting on page 10 of the April 26, 1933 issue. As our stock of this issue is completely exhausted, we cannot supply you with a copy of this article. You will find bound volumes of ELECTRIC REFRIGERATION NEWS in the public library.

Bristol Instrument

No. 2494 (Dealer, North Carolina)—"I would like to know if you could furnish me with the name and address of the company that makes electrical equipment such as electrical recorders and under the trade name of 'Bristol.'"

Answer: Electrical recording equipment under the trade name of "Bristol" is manufactured by the Bristol Co., Waterbury, Conn.

Parts Manufacturers

No. 2495 (Refiner, New York)—"We notice in the July issue of ELECTRIC REFRIGERATION NEWS your subscription order for the 1935 REFRIGERATION DIRECTORY AND MARKET DATA BOOK. We wonder whether this book, besides including the names of the electrical refrigerator manufacturers, includes the electrical refrigerator parts manufacturers. You see, we produce silver solders and brazing alloys and our field includes both of these groups.

"If this directory does not include the latter, we would appreciate any information you can give us as to where they may be obtained."

Answer: You will find a complete list of electric refrigerator parts manufacturers in the 1935 REFRIGERATION AND AIR CONDITIONING DIRECTORY.

Address of Nema

No. 2496 (Manufacturer, Delaware)—"Would you be good enough to send us the address of the National Electric Manufacturers' Association (Nema)?

"We are anxious to obtain some information about the number of commercial and household refrigerators sold in 1935, as well as a comparison of this year's sales with the previous year, and we understand that Nema can supply us with these data."

Answer: Address of the National Electrical Manufacturers Association is 155 East 44th St., New York City.

All statistical and market data information on the electric refrigeration and air-conditioning industries through the end of 1934 is published in the 1935 REFRIGERATION AND AIR CONDITIONING MARKET DATA BOOK. This includes sales of household and commercial refrigerators.

Monthly reports of manufacturers' sales of household and commercial refrigeration equipment are published in ELECTRIC REFRIGERATION NEWS *each* month as soon as the figures are released by Nema, at which time ELECTRIC REFRIGERATION NEWS also makes its estimate of total sales made by all the manufacturers of the industry.

Following are the issues in which sales for the various months of this year are published: Jan. sales—March 13 issue; Feb. sales—April 10; March sales—May 15; April sales—June 5; May sales—July 17; June sales (household)—July 31; June sales (commercial)—Sept. 4; July sales—Sept. 11.

Refrigerants

No. 2497 (Service Man, Illinois)—"Please send me a copy of the issue of ELECTRIC REFRIGERATION NEWS which gave a comparison of the different refrigeration gases, as to efficiency.

Answer: An article by K. M. Newcum on "Properties and Characteristics of Common Refrigerants" appears in the service section of the April 24 issue. Another article by Mr. Newcum in the April 17 issue of the News also contains information regarding refrigerants.

List of Manufacturers

No. 2498 (Manufacturer, Connecticut)—"We are most anxious to receive a list of refrigerator manufacturers. Kindly let us know at your earliest convenience if you have a list of this kind available.

Answer: Manufacturers of household electric refrigerators are listed on pages 235 and 248 of the 1935 REFRIGERATION AND AIR CONDITIONING DIRECTORY.

Refrigerating Data Book

No. 2499 (Distributor, Italy)—"In a former letter we sent you a check for 73.59 lires on the Italian Post corresponding to $6.00 for a subscription to your paper, ELECTRIC REFRIGERATION NEWS, for the year 1935-1936.

"At that time we asked if there was a Refrigeration Guide published in the United States. We referred to a publication similar to the 'Heating and Ventilating Engineers Guide.'"

Answer The Refrigerating Data Book giving engineering data on refrigeration problems, is published by the American Society of Refrigerating Engineers, 37 W. 39th St., New York, N. Y. Cost of this book for readers in countries outside the United States is $4.00 a copy.

Ice Cream Freezers

No. 2500 (Service Company, Quebec, Canada)—"Please send us a copy of all names and addresses of ice cream freezer companies in the U. S."

Answer: Manufacturers of ice cream freezers are listed on pages 203 and 204 of the 1935 REFRIGERATION AND AIR CONDITIONING DIRECTORY.

Obsolescence Factor

No. 2501 (Manufacturer, Michigan)—"What is the obsolescence factor in refrigeration—that is, when are electric refrigerators to be considered obsolete, although they may still be operating."

Answer: We do not know of any authoratative published data on this subject, although one interesting study dealing with this matter, and prepared by Sydney Stein, Jr. and Associates of Chicago, was published in the Dec. 13, 1933 issue of ELECTRIC REFRIGERATION NEWS.

CLASSIFIED

RATES: Fifty words or less, one insertion $2.00, additional words four cents each. Three insertions $5.00, additional words ten cents each.

PAYMENT in advance is required for advertising in this column.

REPLIES to advertisements with Box No. should be addressed to Electric Refrigeration News, 5229 Cass Ave., Detroit, Mich.

POSITIONS AVAILABLE

NEW YORK CITY rebuilt refrigerator and service company requires services of a man experienced in organizing a systematic and profitable service department, servicing all makes of domestic electric refrigerators for real estate concerns and landlords. State qualifications and salary. Box 731, Electric Refrigeration News.

POSITIONS WANTED

EXPERIENCED refrigeration man A-1 auto mechanic. Shop Foreman for large corporation, has operated own business, wishes to make connection with large corporation in Mexico, Central or South America. Can furnish A-1 reference. Box 732, Electric Refrigeration News.

ENGINEER with 15 years' experience in vacuum steam jet refrigerating apparatus, with all theoretical and practical data, wishes to be engaged by a reputable concern for the introduction of a highly efficient construction of a steam jet type refrigerating machine for air conditioning suitable for domestic and industrial purposes. No experimenting necessary. Apply to Electric Refrigeration News under "Frigojet," Box 733.

EQUIPMENT FOR SALE

ISOBUTANE: We offer purest and dryest Isobutane for the most exacting scientific purposes; in your 80 lb. cylinders at $0.75, in our 120 lb. cylinders, $0.70, in small lots at $1.00 per pound. The Standard Refrigeration Co. of Pittsburgh, 1138 Dohrman St., McKees Rocks, Pa.

FRANCHISE WANTED

LOCAL DISTRIBUTOR with complete facilities available in Philadelphia, Pa. Attractive sales floor. Ample storage space, and aggressive personnel. Interested in exclusive distributorship of nationally advertised merchandise. Address Box 730, Electric Refrigeration News.

PATENTS

HAVE YOUR patent work done by a specialist. I have had more than 25 years' experience in refrigeration engineering. Prompt searches and reports. Reasonable fees. H. R. Van Deventer (ASRE), Patent Attorney, 342 Madison Avenue, New York City.

REPAIRS

HALECTRIC thermostat repair service. B & B, G.E., Cutler-Hammer, Penn, Ranco, Tag., etc. Expansion valves repaired. Gas service, Ethyl, Methyl, Iso-Butane, Sulphur. Your cylinder or ours. Competitive prices. Halectric Laboratory, 1793 Lakeview Road, Cleveland, Ohio.